Updating the economics of the "War on Cancer": False metaphor and faulty economics

Smita Srinivas, India Lead and Co-Investigator, the Innovation for Cancer Care in Africa Project (ICCA), The Open University, Milton Keynes, UK and the National Centre for Biological Sciences, Tata Institute of Fundamental Research (NCBS-TIFR), Bengaluru, India

The "War on Cancer" is an undoubtedly a poor metaphor. Cancer is a complex biological process, not a single target for bellicose action; science is not organized on war strategy principles; and the winners and losers in a military war reflect neither the experience nor the choices of cancer patients and scientists. A more fundamental problem exists: the economics of the so-called "War" are faulty. The first section of this essay discusses the false War metaphor and its faulty economics. The second describes a more dynamic economic context that draws on evolutionary and institutional perspectives.

Wars come and go and some unfortunately last a long time in the imagination. The so-called "War on Cancer" is faulty on many fronts: metaphorically, one cannot wage a war on cancer because cancer reflects complex biological processes whose science is still being understood, thus any "war" is certain to be "lost"; the costs of better prevention and early treatment combined are vital to understanding the long-run quality of life losses to patients; and that the "war" itself has many fronts including geography, gender, income, and other social divisions and differences *(1)*. The metaphor of war is best seen as a simplistic approach to politics and financing – for industry, for politicians, NGOs, and scientists *(2,3)*. It assumes that led by political will, laboratory science proceeds from R&D to patients in a determined march, partnering with national institutes of health, an active set of industrial firms, and an array of non-profits, with beneficial effects for the economy and rewards for firms. Similar to the "linear model" of science, which used shorthand rhetoric to concentrate investments during the Second World War and establish the supremacy of science, the "War on Cancer" directed investment and claimed an inevitable role for science and industry *(4)*.

One problem with the "war" metaphor is that social priorities are not directly translated as if by a camp of military strategists with a clear finger on the map, tracing the most directly effective path to an outcome. Yet, while the metaphor has been recognized as flawed, the health economics is not always updated *(5)*. Another problem is that a "standard model" of cancer science(s) is not neatly organized on standardized institutional fronts and acts as only one, albeit powerful, source of knowledge and industrial transformation *(6)*. Other sources may be engineering firms, patient networks, "traditional" systems of science, non-profit advocacy, or clinical "applied" research. With multiple biological and social causes and correlates, cancer stakeholders extend well outside the lab-based model.

Industrial organization and technological efforts (both technical and organizational) are thus a fundamental feature of cancer care response from diagnostics to treatment, palliation to rehabilitation. If it becomes easy to identify and abrade a tumour through better laser optics and miniaturization, clinical skills will change. Conversely, making it easier for researchers to study tissue samples can stimulate more ambitious prototyping to advance the design of patient-friendly miniature optics or handheld diagnostics.

A dynamic economics for cancer and health

A dynamic economy is not accurately described as actors under a command and control military tent; neither a linear march to success, nor paths entirely driven by the efficient intentions of a heartless industrial complex. Institutions are the social norms, customs, guidelines, standards, rules, regulations, and laws which, through specific organizations such as government agencies, business firms, or universities, define the scope of the economy. Different institutional combinations exist in all societies. Because these combinations are dynamic and change over time, an older static, non-equilibrium, analysis of technological change is entirely misleading.

The "War's" foundational metaphor arguably reflects a time when cancer was less well understood and the economics of learning and innovation was nascent. Yet, advances in evolutionary and institutional economics in the last 50 years have revolutionized the study of technological change *(7)*. These changes dislodge an equilibrium perspective and emphasize an uncertain search and learning process of firms with no "best" technology *(8)*. One simple heuristic suffices to show different pathways: three domains of an "institutional triad" of production, demand, and delivery can distinguish national health industries, each of which has distinct technological histories *(9)*. "Health policy" and "industrial policy" are separated in this heuristic *(10)*. Laboratory science also historically emerges as only one type of institutional combination, not a universal paradigm. For example, India's cancer profile where a significant incidence is preventable, needs a rethinking of its economics and policy design, with science channelled and publicly supported in priority areas, and firms and other organizations with ears to the ground, encouraged to assess health problems and learn, create, and adapt technologies or service solutions.

Countries with greater industrial self-reliance can more confidently shape their health priorities. While there is no inevitable link between health policies and industrial policies, there may well be a jostling for power by some dominant firms to create and protect the institutional combinations that favour them e.g. intellectual property, market design, technical standards or even their "brand" as friends to NGOs or other communities, or other favourable business strategies. Competition can thus prove to be critical in differentiating effective firms by technology, price, quality, or other patient-friendly features and rejecting expensive solutions by building value-based strategies. At the same time, other social institutions such as welfare regimes and ethos of assistance should be encouraged alongside individual lifestyle shifts. This attention to real-world variety, complexity and uncertainty against an artificial "rigour" of clinical and economic evaluation is also supported by clinicians who study the variable nature of health interventions *(11)*.

The benefits of viewing cancer through the evolution and institutions lens

I have argued that the health industry is best seen as multiple markets and combinatorial problems requiring close attention to non-market institutions. That the social determinants of health might include industrial organization and especially industrial policy is a relatively new acknowledgement, also supported by the need to appreciate the complexity of health interventions *(12)*. Successful supplier countries are those with active firms (public, private, hybrid) and other organizations (non-profits, grassroots, or cooperatives) which will generate new problems and where new markets have to be constituted, regulated, phased out, or cancer priorities addressed through non-market means. Notably, countries with wider health knowledge systems and home-grown abilities to prototype, develop hybrid organizations, and develop treatments or equipment, are a special case of countries, and democracies an especially important sub-group. This is not a normative view but informed by the different historical pathways of nations and products, and far removed from the idea that an "invisible hand" of efficient markets should dominate society. With this conceptual shift comes uncertainty and the need for new methods, but provides a historically more accurate approach toward realistic long-term health policy and plans driven by robust problem-solving *(13)*.

The pharmaceutical industry's history is based largely on chemical industry progression, while biotechnology has had its own evolution *(14)*. Mixed together as they are in cancer science and clinical treatment, there is no definable trajectory of a single industrial pathway, but there certainly can be priorities for accelerating access, accuracy, and humane care. Neither are the dynamic features of industrial organization easily collapsed into a traditional profit-driven description of a "medical-industrial complex", because there are increasingly more actors in the health industry world – public hospitals, non-profits, hybrid platforms and service organizations, charities, or others, who play often invisible search, learning, and solution provider roles, and whose primary motivation may not be profit. Moreover, different sub-sectors have their own learning and regulation requirements, with equipment manufacturers and generic pharmaceuticals difficult to compare; the former suffering industrial rules devised for the latter *(15)*. Similarly, the measures of industry impact and scale have to be context-driven: the degree of vertical integration and industry diversification goals can then be used to assess whether the policy goal is greater numbers of start-ups in handheld devices for breast cancer diagnostics, "big data", fewer cases altogether, or something else entirely.

The industrial foundations of "choosing wisely"

Articles I and V of the Alma Ata Declaration 1971 require a commitment from governments that policy design will ensure responsibility for improvements in population health. Cancer response is therefore shaped by which demand institutions ensure such improved and judicious consumption of care and treatment. Therefore, industrial policies will need to situate cancer strategies beyond a single disease and its clinical management goals to a context-driven industrial response for health enhancements and universal healthcare commitments. At the same time, cancer-generating and multi-industry challenges such as environmental toxicity can be framed within industrial and systemic drivers of health *(16)*.

A technologically contingent approach emphasized that societies need continuous problem-solving capabilities to resolve production, demand and delivery challenges and to clarify what knowledge systems serve them best. Industrial churn in cancer technologies can originate outside cancer. During COVID-19, countries under strict lockdowns or import curbs have behaved in unexpected ways in highly compressed timelines to produce PPE or COVID-19 diagnostic kits and which now shape how their cancer treatment is addressed *(17,18)*.

How institutions and organizations come together illustrates the dynamic problem of morphine production for cancer palliation *(19)*. India has in principle a complete supply chain but in practice one with several production, demand and delivery gaps, from opium cultivation to final opioids availability. Dramatic improvements are certainly possible: industrial gaps between agricultural production, procurement quotas and licences to align with technology upgrading for opium processing; and alignment of national programmes, state bureaucracies, or leading hospital procurement systems to track and anticipate the demand of palliative care morphine. This requires procurement systems to match decentralized district-level networks of regional hospitals and clinics which can see the urgency of morphine availability hiding in plain sight *(20,21)*. Patients are also often unaware that doctors and medical bureaucrats may unwittingly undermine pain management with misplaced worries about addiction or trafficking. Medical and science education, and the training of bureaucrats need updates in dynamic industry models of global and national opioids supply chains, and exposure to economics, engineering, law and ethics.

A second example, Choosing Wisely India, demonstrates why and how traditional US, UK, or Canadian technology priorities for scanning or chemotherapy may need to be re-assessed in Indian or African contexts *(22,23)*. Choosing Wisely India fits within the ambitious National Cancer Grid of India (NCG) with tumour boards and expert panels and Vishwam Connect which combines Indian cancer standards with growing overseas requests *(24)*. If extended to the industrial side, these initiatives can usher in sensible minimum thresholds for standardized imports, identify priority innovations, specify local content requirements that dovetail with economic plans, establish quality or safety standards, and iteratively develop agile procurement or malpractice systems. In turn, such clarity on size and regulation of markets can aid firms in areas such as materials, scanners, lasers, dosage forms, optics, plastic molding and 3-D printing. This departure from cancer's US or European industrial histories, more accurately reflects domestic cancer data as well as domestic technological capabilities.

Conclusion

Major changes in the economics of technological change have emerged in the last half century which can move us beyond unrealistic war metaphors. COVID-19 has also revealed fundamental industrial gaps in global distributed manufacturing, fair pricing for imports or adjudication rules for technology transfer. Global policies in cancer should therefore support, not drive, national dialogues on priorities and evaluation. Health policy and industrial policies are rarely analysed as essentially intertwined. We hope that the Innovation for Cancer Care in Africa (ICCA) project can provide a preliminary body of research to analyze these linkages and improve cancer care in the coming years. ■

Acknowledgements

The support of the Economic and Social Research Council (ESRC) (UK) is gratefully acknowledged in the Innovation for Cancer Care in Africa (ICCA) project (Grant reference ES/S000658/1). The content of this article is the sole responsibility of the author and does not necessarily reflect the views of the UK ESRC. I thank the Editors of Cancer Control, Mark Lodge for the invitation, Prof. Maureen Mackintosh of the Open University UK, and the National Centre for Biological Sciences-Tata Institute of Fundamental Research (NCBS-TIFR), Bengaluru, India.

Professor Smita Srinivas *(TC-Lab) is India project lead of the Open University UK-led Innovation for Cancer Care in Africa (ICCA) at NCBS-TIFR. She recently served as Co-Chair of the T20 Global Health and Covid-19 Task Force for G20 policy inputs; and as expert for UNIDO's 2022 Industrial Development Report. Professor Srinivas is the 2021 Clarence E Ayres Scholar (AFEE). Her book* Market Menagerie *won the 2015 EAEPE Joan Robinson Prize.*

References

1. Kruijff, S., & Van Zweden, C. (2017). The harmful impact of the rhetoric" war on cancer". *European Journal of Surgical Oncology*, 43(6), 963-964.
2. Whether focused 'war-like' efforts actually commenced or not, President Richard Nixon gave some impetus to health policy autonomy through the National Cancer Act [Senate Bill 1828, Enacted December 23, 1971 (P.L. 92-218)]. See https://www.cancer.gov/about-nci/overview/history/national-cancer-act-1971, last accessed Oct 1 2021. The National Cancer Institute, provided autonomy by the Act, supposedly spent US $90 billion until approximately 2010. See Marshall, E. (2011) "Cancer research and the $90 billion metaphor." *Science*, 25 Mar, Vol 331, Issue 6024, pp. 1540-1541.
3. Meisenberg, B. R., & Meisenberg, S. W. (2015). The political use of the cancer metaphor: Negative consequences for the public and the cancer community. *Journal of Cancer Education*, 30(2), 398-399.
4. Godin B. (2006 a) The Linear Model of Innovation: The Historical Construction of an Analytical Framework. *Science, Technology, & Human Values*. 31(6): 639-667.
5. Lakdawalla, D. N., Sun, E. C., Jena, A. B., Reyes, C. M., Goldman, D. P., & Philipson, T. J. (2010). An economic evaluation of the war on cancer. Journal of health economics, 29 (3), 333-346; Also, Cutler, D. M. (2008). Are we finally winning the war on cancer? *Journal of Economic Perspectives*, 22(4), 3-26.
6. Srinivas (forth. 2022) Heuristics and the Microeconomics of Innovation and Development, Innovation and Development. *Special Issue Christopher Freeman Centenary issue.*
7. Nelson RR, Winter SG (1982) An Evolutionary Theory of Economic Change. The Belknap Press of Harvard University Press, Cambridge.
8. Hodgson, G. M. (2007). An institutional and evolutionary perspective on health economics. *Cambridge Journal of Economics*, 32(2), 235-256.
9.Srinivas, S. (2012). Market Menagerie: Health and development in late industrial states. Stanford University Press, Palo Alto, CA.
10. Srinivas, S. (2020) "A New Economics for Health" in A. Mehdi and I. Rajan (Eds.) *Health of the Nation: Perspective for a new India*, Oxford University Press.
11. Greenhalgh, T., Papoutsi, C. (2018) Studying complexity in health services research: desperately seeking an overdue paradigm shift. *BMC* Med 16, 95;
12. M. Mackintosh, G. Banda, . Wamae, and P. Tibandebage (Eds.), Making Medicines in Africa: The Political Economy of Industrializing for Local Health. (Palgrave MacMillan International Political economy series)
13. Srinivas, S. (2016) "Healthy Industries, Unhealthy Populations: Lessons from Indian problem-solving" in M. Mackintosh, G Banda, W Wamae, and P Tibandebage (Eds.), Making Medicines in Africa: The Political Economy of Industrializing for Local Health. (Palgrave MacMillan International Political economy series)
14. Achilladelis, B., & Antonakis, N. (2001). The dynamics of technological innovation: the case of the pharmaceutical industry. Research policy, 30(4), 535-588; Niosi, J. (2011). Complexity and path dependence in biotechnology innovation systems. *Industrial and corporate change*, 20 (6), 1795-1826
15. Srinivas, S. and D. Kale (2021) New approaches to learning and regulation in medical devices and diagnostics, IKD Working Paper 90, The Innovation Knowledge Development Research Centre, The Open University
16. Srinivas, S. (2021) Industrial Policies for Health: The G20 Must Act now, The International Spectator, Istituto Affari Internazionali (IAI) Rome, IAI Commentaries, 21/40 6 p.
17. Banda, G., Mugwagwa, J., Wanjala, C., Mackintosh, M. and Kale, D. (2021) 'Local manufacturing, local supply chains and health security in Africa: lessons from COVID-19', *BMJ* Global Health, 6e006362
18. Srinivas, S., RK Prasad, and P. Rao (2020) The clinical foreground and industrial background: Customizing national strategy for COVID-19 testing, IKD Working Paper 87, Innovation, Knowledge and Development Centre (IKD), The Open University.
19. Berterame, S., Erthal, J., Thomas, J., Fellner, S., Vosse, B., Clare, P., ... & Mattick, R. P. (2016). Use of and barriers to access to opioid analgesics: a worldwide, regional, and national study. *The Lancet*, 387(10028), 1644-1656.
20. Pallium India (2012). A Morphine Manifesto. Journal of Pain & Palliative Care *Pharmacotherapy*, 26(2), 144-145.
21. Steenmans, I., Daniels, C., Makene, F., Ngoma, T., Mujinja, P.G.M., Mackintosh, M., Cross, C., Ngilangwa, R. and Chataway, J. (2021) 'Cancer pain management in Tanzania: using scenarios to explore critical interrelationships and potential interventions'. ESRF and ICCA Working Paper. Available at: https://esrf.or.tz/wp-content/uploads/2021/08/ICCA-Scenarios-Working-Pap...
22. Pramesh, C. S., Chaturvedi, H., Reddy, V. A., Saikia, T., Ghoshal, S., Pandit, M., ... & Booth, C. M. (2019). Choosing Wisely India: ten low-value or harmful practices that should be avoided in cancer care. *The Lancet Oncology*, 20(4), e218-e223.
23. Rubagumya, F., Mitera, G., Ka, S., Manirakiza, A., Decuir, P., Msadabwe, S. C., ... & Hammad, N. (2020). Choosing wisely Africa: ten low-value or harmful practices that should be avoided in cancer care. *JCO Global Oncology*, 6, 1192-1199.
24. Sengar, M. (2019). National Cancer Grid: a model for collaboration in cancer care and research. *Annals of Oncology*, 30, vi12.