NITheP
National Institute for Theoretical Physics

NITheP Colloquium
Monday, 15 February 2021, 16h00

Prof Nico Orce | University of the Western Cape

"COVID19 situation in South Africa using new epidemiological models"

We have solved the SIR transmission-dynamics equations analytically with (ESIR model) and without (D model) recovery assumptions, characterizing the evolution of pandemic waves at different stages (exponential and slowdown phases, peak, decay, etc). Monte-Carlo simulations also support these pandemic trends. We applied our models to the first and second waves worldwide. For the first wave, similar trends suggest a common pandemic evolution with universal parameters. Although lockdown conditions continuously change, affecting the initial conditions of the transmission-dynamics equations, our models can be extended to describe additional spatial-time effects arising, for instance, from the release of lockdown measures.

For the second wave in South Africa, we predicted its peak at the end of January in agreement with data. Data continued following the predicted trend while in Level 3 conditions, a declining trend which may continue until ~20 February. Additional effects from lifting restrictions and starting school (Feb 15) may likely manifest at the end of February, early March, broadening out the pandemic trend or inducing yet another wave. The final outcome strongly depends on our personal behaviour preventing viral spreading from now on. Finally, similar results from ESIR and D models suggest that most susceptibles become infected, asymptomatic and eventually recover.

Our work has been published in Applied Mathematical Modelling (https://doi.org/10.1016/j.apm.2020.10.019).

BIOGRAPHY

Nico Orce is a nuclear physicist whose passions are quality science and transformation. Nico's research mainly involves fundamental and applied nuclear physics, but also astronomy and mathematical modelling. He has broadly explored the nuclear chart using a wide variety of nuclear techniques and theoretical calculations, and discovered new types of collective excitations and shell phenomena in nuclei. Nico is leading research proposals at different laboratories and observatories around the world, including MANDELAb, iThemba LABS, SALT, MLL, TRIUMF and CERN, and has secured research funds worth > R50M. He is the leading Investigator and spokesperson of the GAMKA spectrometer, chair of the Tastes of Nuclear Physics, Referee of most nuclear physics journals, and Honorary Visiting Professor at the University of York. Nico has graduated 20 MSc and PhD students with research projects generally approved by international committees. His students have travelled the world to gain hands-on experience, presented at international conferences, run their own experiments in world-class facilities such as TRIUMF and CERN and led publications in top international journals such as Physics Letters B and Nature Communications. For more info: http://nuclear.uwc.ac.za/

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