Assessing the Reduction Strategies of the Italian Measles Outbreaks through Dynamic Performance Management (DPM) approach

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Background

While global measles vaccination coverage has increased, resulting in a significant reduction in global measles mortality (De Vries, 2015, p. 1), in Italy the infectious cases had dramatically increased during 2017 from 861 to 5399, meanwhile the prevalence of MMR (Measles, Mumps, Rubella) infant vaccination population decreased by 5% from 90.4% in 2013 to 85.3% in 2015. Previously, Italian people did not perceive Measles a severe problem, and anti-vaccine movements have gained popularity, dangerously publicising unfounded vaccine safety concerns. Moreover, there is much evidence that Italian Regions with financial problems devote less attention and fewer resources for prevention activities (Adamo, 2016, p. 1). However, after the implementation of the mandatory childhood immunisation program, the coverage raised to 91.84% and the infectious cases reduced to 2682 in 2018.

Fig. 1 *Multifactorial components crossing on the evolution of Measles Outbreaks*

Research Objective and Research Questions

By using System Dynamics methodology (Sterman, 2000) and DPM Framework (Bianchi, 2016; Bivona and Cosenz, 2017), this work aims to analyse the dynamic causal relationships of the evolution of the last Italian measles outbreaks, considering its social, epidemiological and financial factors.
In short, the study attempts to answer these main research questions:
RQ 1. Which key factors led to the measles outbreak of 2017?
RQ 2. What is the dynamic explanation of the oscillations of the infectious measles cases in Italy?
RQ3: What hypothetical sustainable policies can reduce the risk of a measles outbreak?

Fig. 2 *Interconnecting multisectoral System Dynamics dimensions through Isee Stella Architect Software*

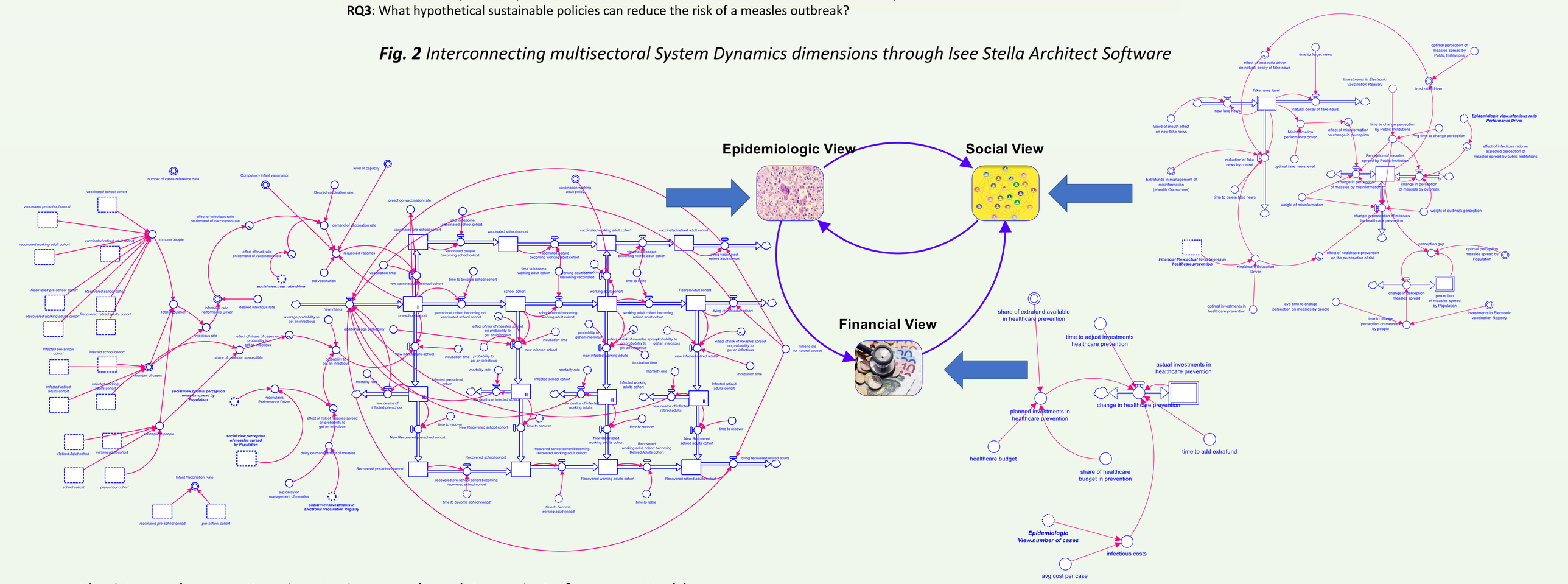


Fig. 3 *From Theory to Practice: An Outcome-based Dynamic Performance Health Management framework for the management of Measles in Italy*

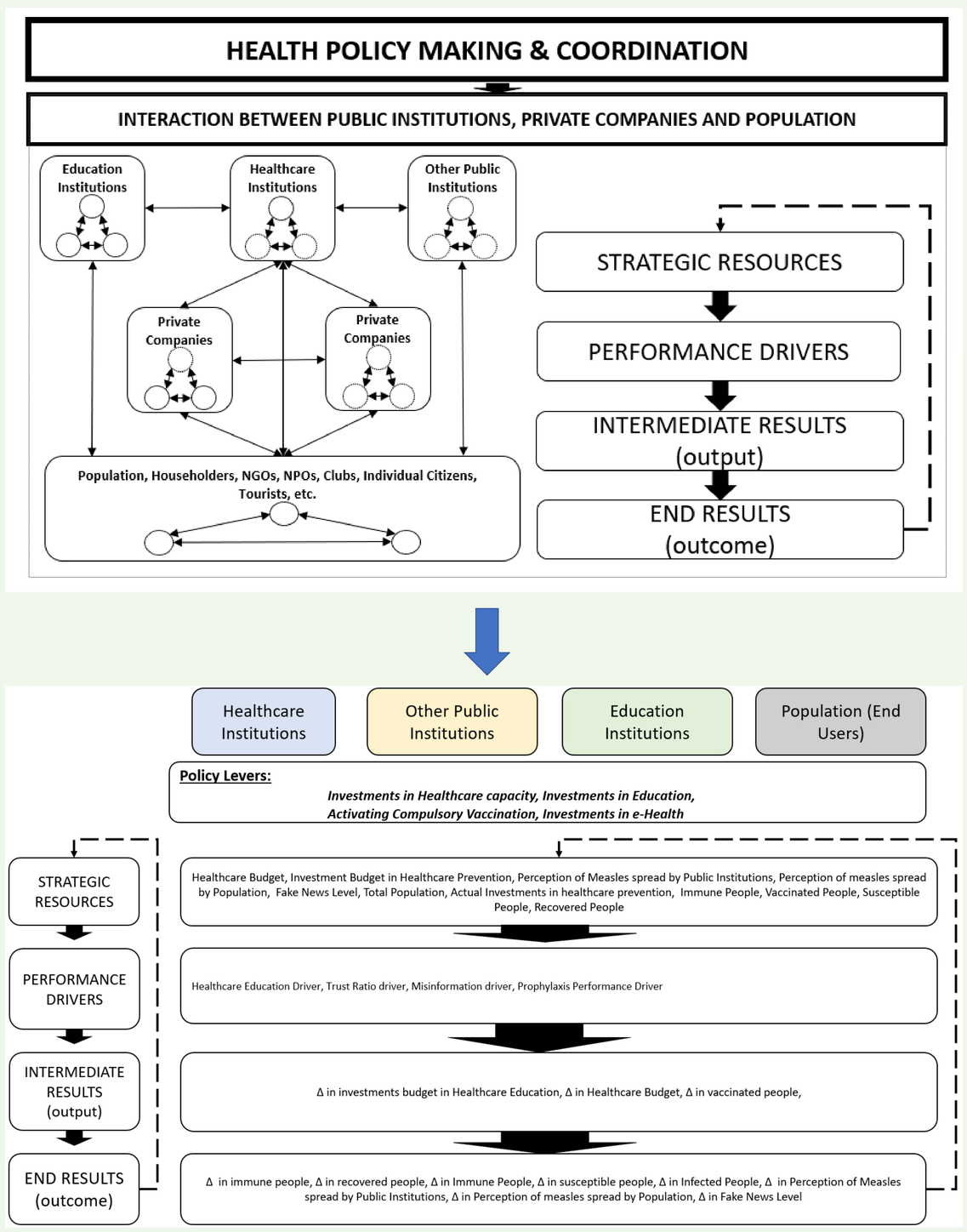
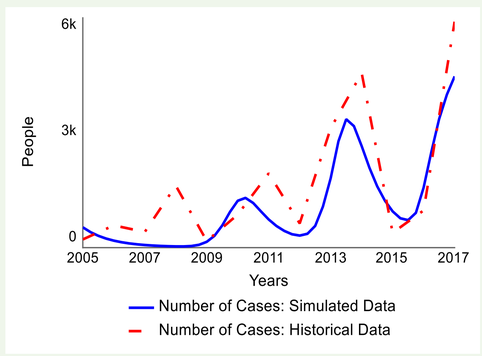
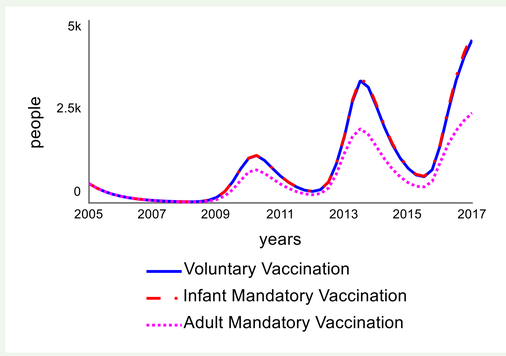


Fig. 4 *Simulation Outcomes*

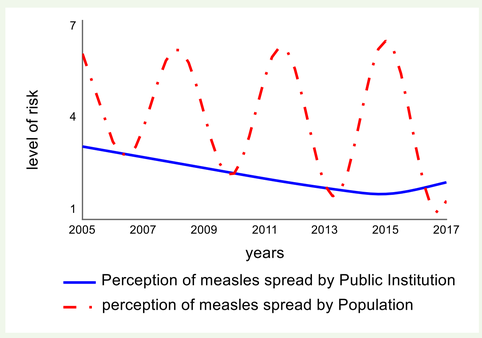
Simulation vs Reality



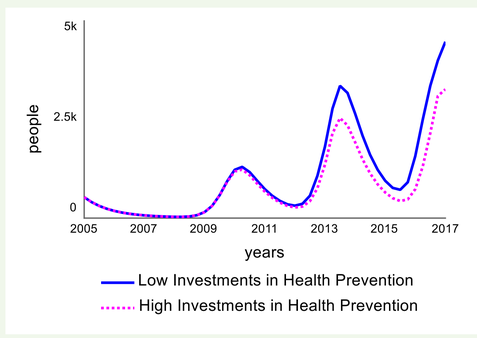
Mandatory Vaccination Policies



Measles Perception: Population vs Public Institution



Investing in Health Prevention



Results and Conclusions

The model was able to explain the key factors that led the measles outbreak in 2017 (**RQ1**) and the dynamic oscillations (**RQ2**), showing how the financial and social aspects have significant attrition on the effectiveness of public health. The model has shown that the low level of vaccination (**RQ1 and RQ2**) is due to a cultural deficit (confirming what reported in the scientific literature), damaged by the spread of fake news, and by an underestimation of the problem due to a trade-off between urgent contingent problems and long-term planning needs. Undoubtedly the introduction of a mandatory vaccine (**RQ3**) for those at risk, in a demagogic cultural context, can be a useful tool of health policy in the short term; this approach, however, should be superseded by a collaborative logic in the long term. Considering that the median age of cases is about 30 years, it is advisable to implement a mandatory vaccination policy towards adult generations (**RQ3**), starting from those professional categories most at risk (health personnel, social workers and school staff). The latest efforts in the field of vaccination policy must be appreciated, but until some public health choices relate to phenomena of medical populism (Lasco, 2019), oscillatory phenomena with severe epidemic peaks can recur.
DPM and SD can help to foster public healthcare policies as shown by the Measles Case. The need for detailed analytical information in order to obtain a truthful model requires more significant development of the computerisation of health data, also crossing information obtained from public organisations having different competence.
While on the one hand, the DPM can help to filter out the redundancy of information obtainable from different health databases, on the other hand, it is necessary to develop a process of involvement and facilitation in the use of these tools within public institutions.