Anti-Covid 19 mass screening: 
UniTrento develops the logistic model for South Tyrol

The Department of Industrial Engineering to support the South Tyrolean Health Authority for the campaign of 350 thousand Covid antigenic tests to be carried out in three days. The mathematical model developed replicates all physical variables and harmonizes them to predict the best organizational and logistical solutions. The experience gained over the years thanks to international collaborations with colleagues involved in similar campaigns such as mass vaccination against the H1N1 epidemic in the United States in 2009. Now the challenge: to organize the distribution of the next Covid-19 vaccine by spring.

Trento, November 18, 2020 - (a.s.) Mass Covid swabs in just three days on 350 thousand citizens: this is the screening project launched by the Autonomous Province of Bolzano to stem contagions with the identification and isolation of asymptomatic positive people. The large-scale operation will be carried out next weekend, between 20 and 22 November. To develop it, the South Tyrolean Health Agency has turned to the University of Trento, which at the Department of Industrial Engineering studies the modeling of complex processes also in support of health strategies, such as vaccination campaigns, mass screening or, in this case, preventive swabs on a large population.

A logistic simulation of this magnitude is indeed a complex machine. It is necessary to predict with the maximum possible precision the workloads, the types and the number of specialized personnel to be involved, the consumables, the instrumentation, the minimum necessary spaces and last but not least, the time of execution of the intervention and the length of the queues. To harmonize all these variables, Professors Francesco Pilati and Giandomenico Nollo of the Department of Industrial Engineering have developed an innovative prototype of "Digital Twin": a virtual replica of a real physical system with potential and actual resources related to objects, processes, people, places, infrastructures, systems and devices. A tool that usually applies to complex production processes, logistics and distribution systems.

In the case of the Covid massive antigenic test campaign planned in South Tyrol the chosen mode is "walk-in" on a voluntary basis. To ensure an adequate efficiency to this process, the researchers of the University of Trentino have designed 184 test sites (e.g. clinics or points of dispense) geographically distributed throughout the province with the use of over 1400 operators for the administration of the tests and with the involvement of the Civil Protection, White Cross and Red Cross, voluntary firefighters and administrative staff.

The mathematical models applied also in this case derive from a consolidated experience, gained in the field of management engineering, in the optimization of industrial processes and in the study and analysis of health technology assessment, management processes and clinical governance. "This approach - explains the engineer Francesco Pilati - has already
proved effective in previous vaccination campaigns, such as that for the H1N1 epidemic in the United States. In particular, we have a solid collaboration with the School of Industrial Engineering & Management of Oklahoma State University (USA) that in 2009 successfully organized for the state of Kentucky a site/clinic capable of vaccinating several thousand patients per day in "drive through" mode to fight that epidemic. The mathematical models developed by us have been parameterized with data collected in real scenarios during the recent weeks of influenza vaccination, serological mini-screening and swabs carried out in the Autonomous Province of Bolzano, also thanks to the activity carried out by our doctoral student Riccardo Tronconi”.

This knowledge may also be particularly useful in the upcoming large-scale vaccination campaign for Covid-19 throughout Italy, linked to the availability at the end of the year or at the latest next spring of one or more vaccine products. A situation that will require significant organizational and logistical interventions. "For direct knowledge - says Professor Giandomenico Nollo - we know how Germany and England are preparing their vaccination plans and similarly organizing clinics for mass vaccination for the entire population. The German plan, for example, seems to provide for the storage of vaccine doses in a central repository and their subsequent distribution to more than 60 regional centers, with the possibility of using the exhibition halls for the vaccination of more than 80 million Germans. The work done in recent months gives us a competitive advantage that we can and must exploit. According to the assumptions of these days, at the beginning of next year we might want to vaccinate 14 million Italians, or 23% of the population with two doses to inoculate with 14 days of difference. Bringing this topic to the case of our province, we should vaccinate 124 thousand people. With our models with seven large sports arenas or similar indoor facilities the operation could be neatly concluded in 28 days”.

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