



PhD in SCIENCE, TECHNOLOGY AND POLICY FOR SUSTAINABLE CHANGE - 39th cycle

THEMATIC Research Field: A ONEHEALTH MODELLING FRAMEWORK FOR EMERGING ZONOTIC DISEASE SPREAD PREPAREDNESS

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

At the global scale, trillions of euros are being spent on post-COVID recovery plans, with most initiatives focused on response (vaccines, medical treatments and the like). In contrast, to ultimately reduce the likelihood of future pandemics as part of an effective One Health strategy, there is still a lack of focus on risk prevention, which could target the emergence and early transmission of zoonotic diseases. Prevention alone would not be sufficient to avert the risk of rapidly spreading diseases such as COVID-19, as instead occurred for the SARS epidemics successfully controlled in 2003. Early containment measures are also crucial to reduce the medical, societal, and economic burden of a newly emerging pathogen spreading in a country or beyond. The development of generalized prevention and preparedness plans potentially targeting a wide range of zoonotic agents (e.g., viruses) is a global and urgent sustainable development task. The research activities of this PhD research will be developed in the framework of the PREPARED project (Prot. 2022S283YM), funded by the Italian Ministry of University and Research through the 2022 edition of the PRIN program. The overall goal of the project is to operationalize One Health pandemic preparedness by integrating ecological prediction of disease emergence in pantropical areas (the *sources*) with modeling of disease transmission risk in European countries (the *sinks*). The PhD researcher will work at: 1) the design and analysis of local-scale models for the transmission of the viral agents



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| | <p>responsible for some of the top priority diseases in the WHO's Blueprint list (e.g., betacoronaviruses, ebolaviruses, flaviviruses, and henipaviruses); 2) the identification and modelling of human mobility mechanisms that are key to pathogen spread at different spatial scales (e.g., long-distance movement from global scale sources to sinks vs. short-distance mobility at the sink country level); and 3) the eventual development of spatially explicit models for the spread of priority diseases in Italy and selected European countries, also including a quantitative description of containment strategies. Scientific and technological tools to model the early transmission of zoonotic emerging diseases can provide effective knowledge to support pandemic preparedness at different scales and successfully complement the understanding and reduction of disease emergence at sources. The expected results of the project may therefore have great potential for policy uptake.</p> <p>CUP: D53D23008280006</p> |
| <p>Methods and techniques that will be developed and used to carry out the research</p> | <p>The successful candidate will (1) develop compartmental epidemiological models to describe the transmission of the selected diseases through pathogen-specific transmission routes (e.g., airborne, contact, sexual, vertical) within a well-mixed, spatially homogeneous human community; (2) analyze actual data (e.g., passenger and cargo air traffic) and theoretical descriptions (e.g., gravity vs. radiation models) of human mobility at different spatial scales; and (3) develop metacommunity-like, network-based models to analyze the spatiotemporal spread of the selected diseases in realistic geographic settings (e.g., Italy and other European countries) and to evaluate promising disease containment strategies.</p> |
| <p>Educational objectives</p> | <p>The successful candidate will work in a highly interdisciplinary environment. They will have the opportunity to acquire state-of-the-art skills in the analysis of epidemiological models, data analytics for human mobility, and the development of spatially explicit models for disease ecology and epidemiology.</p> |



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| Job opportunities | Upon completion of the PhD program, the successful candidate will be exposed to job opportunities in various fields, from academia and research centers to policy-making agencies, in both the private and the public sectors, nationally and internationally. |
| Composition of the research group | 1 Full Professors 2 Associated Professors 3 Assistant Professors 3 PhD Students |
| Name of the research directors | PROFF. RENATO CASAGRANDI - LORENZO MARI |

| Contacts | |
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| Renato Casagrandi, renato.casagrandi@polimi.it | |
| Lorenzo Mari lorenzo.mari@polimi.it | |

| Additional support - Financial aid per PhD student per year (gross amount) | |
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| Housing - Foreign Students | -- |
| Housing - Out-of-town residents (more than 80Km out of Milano) | -- |

| Scholarship Increase for a period abroad | |
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| Amount monthly | 700.0 € |
| By number of months | 6 |

| Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information | |
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| <p>educational activity: financial aid per PhD student (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences) teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. computer availability: individual use desk availability: individual use any other information: The research advisors are part of PoliMi's Ecology group (https://www.ecologia.polimi.it/)</p> | |