

Public Health Epidemiology, Statistics And Economics

Progetto di ricerca Research project	<p><i>“Analisi dei fattori di rischio cardio-metabolico a livello di popolazione e loro proiezione in relazione alla transizione demografica ed epidemiologica e alla evoluzione digitale” – PUBLIC. 1</i></p> <p><i>“Population-level analysis of cardio-metabolic risk factors and their prediction based on the demographic and epidemiologic transitions and digital evolution” - PUBLIC. 1</i></p>
Tipo/Type	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex 118/2023</p>
Borse/Scholarships	1
Abstract	<p>ITA</p> <p>Il progetto userà i dati provenienti dallo studio dei fattori di rischio cardio-metabolico che coinvolge – nella produzione di dati-informazione-conoscenza – un campione rappresentativo della popolazione ed è attualmente previsto all’interno del progetto MUSA. Nello specifico, la ricerca si focalizzerà sulle determinanti dei fattori di rischio, sulle interazioni tra i fattori di rischio e malattia, sulle conseguenze relative all’insorgenza di singole patologie e della presenza di pluripatologia.</p> <p>Il progetto si propone di usare le stime proiettandole a livello della popolazione generale, stimandone la componente attribuibile alle principali determinanti modificabili individuali ed ambientali, stimandone la frazione prevenibile sulla base delle conoscenze attuali.</p> <p>Inoltre, verranno proiettati l’evoluzione, gli effetti e l’impatto nel medio/lungo periodo di tali condizioni in funzione delle dinamiche demografiche, ambientali e tecnologiche.</p> <p>Tale evoluzione, dovrà necessariamente considerare l’impatto delle tecnologie digitali nella gestione delle condizioni cliniche di interesse. Pertanto, un obiettivo rilevante per il progetto consisterà nella comprensione del ruolo che gli strumenti digitali possono ricoprire nell’assistenza sanitaria e se l’utilizzo di tali strumenti possa consentire di raggiungere una maggiore equità di accesso alle cure per i pazienti. Gli aspetti principali che andranno indagati riguarderanno: gli strumenti tecnologici e la gestione dei dati, l’uso di sensori innovativi per la medicina di prossimità e l’applicazione strumenti per il monitoraggio dei pazienti cronici.</p> <p>ENG</p> <p>In the framework of the MUSA project, this research will exploit population-level data on cardio-metabolic risk factors to model a specific data-information-knowledge cycle. The project will focus on the risk determinants, the relationship between risk factors and disease, and the consequences of morbidity and pluri-morbidity. In so doing, estimated outcomes and the projected measurement data will be used to compute the proportion attributable to modifiable individual and</p>

	environmental determinants, as well as the preventable fraction. Trends, effects and impacts of each condition of interests will be forecasted based on demographic, environmental and technological dynamics. To meet the research's goals, the contribution of digital technologies will be also examined, aiming at understanding their role in the improvement of patient care and care access. On this point, the explored aspects will primarily include: digital tools and data management, innovative sensors for health monitoring in community medicine settings and patient-centered mobile health tracking devices.
Tutor	Prof. Paolo Berta e Sara Conti
Mesi previsti in azienda Expected months at the company	IRCCS Istituto Auxologico Italiano 12
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Public Health Epidemiology, Statistics And Economics

<p>Progetto di ricerca Research project</p>	<p><i>“Promozione di efficacia, efficienza e sostenibilità del sistema salute: sviluppo ed applicazione di modelli predittivi per la stima dinamica dei bisogni, della domanda e dell’accesso ai servizi sanitari altamente innovativi e ad elevato impatto economico-sanitario” - PUBLIC. 2</i></p> <p><i>“Enhancing the efficacy, efficiency, and financial sustainability of the health system through the use of dynamic predictive models able to predict demand, assess needs, and devise access plans for highly innovative costly healthcare services” - PUBLIC. 2</i></p>
<p>Tipo/Type</p>	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex 118/2023</p>
<p>Borse/Scholarships</p>	<p>1</p>
<p>Abstract</p>	<p>ITA</p> <p>Il progetto svilupperà e validerà modelli predittivi per stimare la domanda di e l’accesso ai servizi di sanità pubblica in generale, focalizzandosi su quelli altamente innovativi e ad elevato impatto economico. A tal fine saranno sviluppati ed usati adeguati modelli statistici mediante l’uso di grandi basi dati relative all’accesso dei servizi sanitari oggetto del progetto, le quali saranno messe a disposizione dai partner del progetto. Inoltre, i modelli predittivi saranno di natura dinamica ed incorporeranno, a livello di stime stocastiche di popolazione, le dinamiche attese nei prossimi 10-20 anni di natura demografica (ad es. invecchiamento della popolazione, urbanizzazione/deurbanizzazione). Verranno, inoltre, ipotizzati diversi scenari di evoluzione tecnologica (ad es. introduzione di nuove tecnologie/servizi/farmaci), di variazione degli stili di vita e di mutamento climatico, per integrare le proiezioni utilizzando anche questi driver della domanda di salute. Vari scenari associati alle diverse potenziali dinamiche saranno esplorati e confrontati.</p> <p>I risultati forniti dai modelli predittivi potranno aiutare i decisori nell’allocazione delle risorse, nella progettazione di programmi efficaci di salute pubblica e nella formulazione di politiche per migliorare gli esiti sanitari della popolazione. Questo progetto ha il potenziale per apportare significativi contributi alla salute pubblica, consentendo ai responsabili delle decisioni di prendere decisioni informate basate su evidenze e dati affidabili.</p> <p>ENG</p> <p>The project aims to create and validate predictive models able to estimate the demand for and access to public health services, with a particular emphasis on innovative and economically impactful services. This will be accomplished by developing and utilizing appropriate statistical models based on large administrative databases provided by the project partners. Predictive models will be dynamic in nature and will incorporate stochastic population parameters that reflect different potential scenarios on demographic and technological changes that are expected to occur over the next 10-20 years, such as aging population, urbanization/deurbanization, introduction of new technologies, services and drugs,</p>

	<p>as well as individual and environmental factors, including potentially climate and lifestyle changes. The various scenarios associated with different potential dynamics will be explored and compared.</p> <p>The insights provided by these predictive models could aid decision-makers in allocating resources, designing effective public health programs, and devising policies to improve health outcomes for population. This project has the potential to make significant contributions to public health by enabling policymakers to make informed decisions that are based on sound evidence and data.</p>
Tutor	Prof. Vincenzo Bagnardi, Paolo Berta e Sara Conti
Mesi previsti in azienda Expected months at the company	Regione Lombardia, Direzione Generale Welfare 12
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

Public Health Epidemiology, Statistics And Economics

Progetto di ricerca Research project	<i>"Evidence-based models for high impact chronic disease prevention and risk of progression: towards eHealth platform, using machine learning and artificial intelligence on administrative and clinical databases"</i> - PUBLIC. 3
Tipo Type	Borsa Dipartimento/PNRR Scholarship Department/ PNRR
Borse Scholarships	1
Abstract	ENG Definition and treatment of high-impact chronic conditions (HICDs) at individual and population level is a crucial feature of the health system, particularly so in the context of prevention of disease worsening (tertiary prevention). An aim of the PNNR project is to integrate different sources of individual-level health information (administrative databases and clinical databases) for patient classification into clusters by the current state of their chronic condition(s) (isoseverity), health resources consumption (iso-resources) and risk of disease progression. The candidate will work on dynamic stratification of the population, intended as the detection of high-impact chronic conditions and the prediction of their evolution. This will be obtained by integrating algorithms for the stratification of chronic conditions and for outcome prediction. This phase will be carried out using approaches based on conventional statistical models and on Artificial Intelligence / Machine Learning systems and will lead to the development of an integrated eHealth platform. This can allow health providers to properly act in order to prevent disease worsening, and to change the course of action once a disease has worsened.
Tutor	Prof.ssa Paola Rebora
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<p><i>“Applicazioni del machine learning in ambito di sanità pubblica e ricerca clinica: sviluppo di modelli interpretabili” – PUBLIC. 4</i></p> <p><i>“Applications of machine learning in public health and clinical research: development of interpretable models” - PUBLIC. 4</i></p>
Tipo Type	<p>Borsa finanziata da ente esterno D.M. 117/2023</p> <p>Scholarship funded by external body D.M. 117/2023</p> <p>RULEX INNOVATION LAB SRL</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>La crescente disponibilità di dati e risorse computazionali conduce a esplorare applicazioni di sempre maggiore portata per quanto riguarda gli strumenti di apprendimento automatico, o machine learning. Spesso però, la rilevanza e la portata dell'applicazione trattata, porta a una maggiore complessità del modello selezionato e, conseguentemente, a una minore interpretabilità. In altre parole, un risultato quantitativamente valido rischia di accompagnarsi a una forte difficoltà nel determinare, anche per sommi capi, quali elementi siano stati valutati dall'algoritmo scelto, e in che modo, per ottenerlo. Tale aspetto è di interesse soprattutto in ambiti particolarmente critici, come quello sanitario e della ricerca clinica, in cui la risposta alla domanda “perché”, combinata con la conoscenza degli esperti, può essere spunto per ulteriori sperimentazioni e ricerche, avviando un circolo virtuoso. Proprio per tenere conto di tale considerazione, sono stati sviluppati modelli di machine learning interpretabili, espressi in termini di una serie di regole if-then: ad esempio, “se la variabile X è minore di 100 e la variabile Y è minore di 10, allora la prognosi è positiva”. Un modello di questo tipo, oltre a fornire una descrizione interpretabile e criticabile del fenomeno, permette di motivare, e di interpretare, future previsioni che verranno espresse in merito. L'obiettivo dell'attività di dottorato proposta è proprio quello di esplorare possibili applicazioni di modelli interpretabili in ambito sanitario e di ricerca clinica, esplorando anche le attività di integrazione e preparazione del dato necessarie a effettuare il training.</p> <p>ENG</p> <p>The growing availability of data and computational resources leads to exploring ever-increasing applications of machine learning tools. However, the relevance and scope of the applications often leads to greater complexity of the selected model and, consequently, to less interpretability. In other words, a quantitatively valid result risks being accompanied by great difficulty in determining which elements have been evaluated by the chosen algorithm and how to obtain it. This aspect is of particular interest in critical areas, such as healthcare and clinical research, where the answer to the question "why", combined with expert knowledge, can be a</p>

	<p>starting point for further experimentation and research, starting a virtuous circle. Yet, interpretable machine-learning models have been developed, expressed in terms of a series of if-then rules: for example, "if the variable X is less than 100 and the variable Y is less than 10, then the prognosis is positive". A model of this type, in addition to providing an interpretable and criticisable description of the phenomenon, allows to motivate, and to interpret, future forecasts that will be expressed on top of that. The objective of the proposed research activity is to explore possible applications of interpretable models in the healthcare and clinical research fields, also exploring the data integration and preparation activities necessary to carry out the training steps.</p>
Tutor	Prof. Marco Carbone
Mesi previsti in azienda Expected months at the company	12
Mesi previsti all'estero Expected months abroad	Min 6
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

<p>Progetto di ricerca Research project</p>	<p><i>“Determinanti delle malattie cardiovascolari e loro complicanze in presenza di forte collinearità” - PUBLIC. 5</i></p> <p><i>“Determinants of cardiovascular diseases and their complications in the presence of strong collinearity” - PUBLIC. 5</i></p>
<p>Tipo Type</p>	<p>Borsa finanziata da ente esterno D.M. 117/2023</p> <p>Scholarship funded by external body D.M. 117/2023</p> <p>ISTITUTO AUXOLOGICO ITALIANO</p>
<p>Borse Scholarships</p>	<p>1</p>
<p>Abstract</p>	<p>ITA</p> <p>Le patologie cardiovascolari sono ad oggi una delle principali cause di morte nei paesi sviluppati (nell’Unione Europea il 49% delle morti sia nell’uomo che nella donna) con un’incidenza in costante aumento. In Italia le malattie cardiovascolari hanno un impatto come costi diretti per il SSN che ammonta a circa 16 miliardi di euro all'anno, ai quali vanno aggiunti circa 5 miliardi di euro calcolabili come perdita di produttività. L’Italia si attesta al 20esimo posto a livello mondiale per lo stato di salute dei cittadini, secondo il “Global Burden of Disease”: tra le principali problematiche di salute il sovrappeso, negli adulti ma soprattutto nei bambini, la qualità dell’aria e l’abitudine al fumo di sigaretta. Tutti aspetti, quelli elencati, che ritroviamo tra i principali fattori di rischio delle malattie cardiovascolari. Negli ultimi anni, inoltre, sono emersi nuovi potenziali fattori di rischio quali le apnee notturne, il livello di calcio, la proteina C-reattiva, lo spessore della carotide, l’omocisteina, la fosfolipasi A2 associata alle lipoproteine e la funzionalità delle lipoproteine ad alta densità. Lo studio di questi determinanti spesso richiede l’applicazione di metodologie appropriate per affrontare il problema della collinearità tra le variabili che, se presente, può produrre stime distorte e imprecise della misura di associazione di interesse. Il dottorando dovrà quindi affrontare la letteratura teorica sulle metodologie biostatistiche standard e innovative che affrontano tale problema e implementarle in studi ad hoc o nell’analisi di dati secondari, così come le tecniche che consentono di integrare diverse fonti informative caratterizzate da differenti livelli di solidità.</p> <p>ENG</p> <p>Cardiovascular diseases are to date one of the leading causes of death in developed countries (in the European Union, 49% of deaths in both men and women) with a steadily increasing incidence. In Italy, cardiovascular diseases have an impact as direct costs for the National Health Service that amounts to about 16 billion euros per year, to which must be added about 5 billion euros that can be calculated as lost productivity. Italy ranks 20th worldwide for the health status of its citizens, according to the "Global Burden of Disease": the main health issues are overweight,</p>

	<p>in adults but especially in children, air quality and cigarette smoking habits. All these aspects are main risk factors for cardiovascular diseases. In recent years, moreover, new potential risk factors have emerged such as sleep apnea, calcium level, C-reactive protein, carotid artery thickness, homocysteine, lipoprotein-associated phospholipase A2, and high-density lipoprotein function.</p> <p>The study of these determinants often requires the application of appropriate biostatistical methodologies to address collinearity between the variables, which, if present, can produce biased and inaccurate estimates of the association measure of interest.</p> <p>The Ph.D. student will study the literature on standard and innovative biostatistical methodologies that address this problem and implement them in ad hoc studies or in the analysis of secondary data. Moreover, he/she will deep the techniques that allow the integration of multiple information sources characterized by different levels of robustness.</p>
Tutor	Prof. Antonella Zambon
Mesi previsti in azienda Expected months at the company	18
Mesi previsti all'estero Expected months abroad	Min. 6
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<i>"Health economics and outcomes research methods: application and development in gastroenterology"</i> - PUBLIC. 6
Tipo Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 Fondazione Italiana Per La Ricerca Sulle Malattie Apparato Digerente (FIRMAD) Onlus
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Health economics and outcomes research methods are used to promote the efficient and equitable allocation of healthcare resources in public health. The discipline of economic evaluation is grounded on seminal theories of health economics that relate the value of healthcare to individuals and society. Statistical and decision sciences further enable researchers to build upon these theories and model the value of healthcare technologies to individuals and society. Some examples of this research include the evaluation of the value of new pharmaceuticals to existing therapies, the value of screening program, or the value of a public health campaign to provide safety. The discipline of outcomes research is grounded on seminal theories of health services that relate the role of healthcare to improving the lives of individuals and society. These theories enable researchers to identify important clinical, patient, provider outcomes; design measurement techniques to capture different outcomes; and incorporate outcomes measurement into health systems. Specific examples of this research include assessing the impact of new pharmaceuticals on patient outcomes, how to measure a new approach to healthcare delivery, or how to validate a new patient reported outcomes instrument for a specific population. The PhD student included in this program will develop a range of skills including data analysis and economic modeling to assess and promote value in healthcare, and thus will become capable of understanding the complex phenomena related to decision making in healthcare, i.e. a multidisciplinary environment. Under the supervision of faculty members, the PhD student will apply economic evaluations and outcomes research on medical interventions in gastroenterological area (e.g. IBD treatment, colon-rectal cancer management, diagnostic test) and then develop and apply his/her own research focusing on methodological aspects and application of these methods in real decisional problems, including screening program of gastroenterological condition (e.g. colon-rectal cancer)</p>

Tutor	Prof. Paolo Angelo Cortesi
Mesi previsti in azienda Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<i>"Development and application of decision analytical modelling to healthcare problems"</i> – PUBLIC. 7
Tipo/Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 Fondazione Charta
Borse/Scholarships	1
Abstract	<p>ENG</p> <p>One of the main tasks in healthcare is making difficult decisions regarding which healthcare interventions will be funded and with which priority, within a framework of limited resources. Decision analytical models applied to health economics analysis are fundamental methods developed to help healthcare decision makers in order to define the value of interventions and their sustainability.</p> <p>The PhD student will be trained to master the variety of theoretical and applied approaches that are used in decision analytical modelling and health economics to assess healthcare interventions and technologies throughout their lifecycle. The student will acquire a broad set of research skills in model construction and health technology assessment, and thus become capable of understanding the complex phenomena related to decision making in healthcare, i.e. a multidisciplinary environment.</p> <p>Under the supervision of faculty members, the PhD student will then proceed on single innovative technology (e.g. drug, medical device, diagnostic test) appraisals (STA) and then develop and apply his/her own research focusing on methodological aspects and application of these methods in real decisional problems, including multiple technology appraisals (MTA).</p>
Tutor	Prof. Lorenzo Giovanni Mantovani
Mesi previsti in azienda Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<i>"Estimating the burden of chronic diseases in the general population using real-world data"</i> – PUBLIC. 8
Tipo/Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 THIN SRL
Borse/Scholarships	1
Abstract	<p>ENG</p> <p>Data on disease burden are often used for assessing population health, evaluating the effectiveness of interventions, formulating health policies, and planning future resource allocation. In this context, real-world data (RWD) can play a significant role in retrieving relevant information and supporting public health response, as evidenced by the COVID-19 pandemic.</p> <p>This project focus will be on the use of RWD, either newly acquired or from existing sources (such as data from clinical professional, societies/associations) to monitor the epidemiology and the process of care of chronic diseases commonly encountered in clinical practice, as well as the clinical management of adults with complex chronic conditions. The PhD student will be trained to master the variety of RWD, as well as the epidemiological and economic measures, that can be used to monitor the disease burden.</p> <p>The student will also acquire a broad set of research skills in disease algorithm development, terminology mapping, model development for risk factors, and health technology assessment, thus becoming capable of understanding the complex phenomena related to disease burden in healthcare, i.e., a multidisciplinary environment encompassing statistical, epidemiological, clinical, and economical profiles. Under the supervision of faculty members, the PhD student will then proceed to learn how to implement the information on disease burden in the development of single innovative technologies (e.g., drug, medical device, diagnostic test) in the perspective of different health authorities like regulators of safety and efficacy or health technology assessment bodies.</p>
Tutor	Prof. Giampiero Mazzaglia
Mesi previsti in azienda/Expected months at the company	18
Mesi previsti all'estero/Expected months abroad	6 – 12
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<i>"A living systematic review and meta-analysis on the impact of sex on response to immunotherapy and targeted therapy in cancer patients"</i> – PUBLIC. 9
Tipo/Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 Cliniche Gavazzeni S.p.A.
Borse/Scholarships	1
Abstract	<p>ENG</p> <p>Target and immunotherapies have completely reshaped the treatment paradigm in oncology during the last decade. These innovative approaches aim to address cancer at its root, either by targeting specific genes, proteins, or tissue environments that support cancer growth or by enhancing the body's own immune system to better recognize and destroy cancer cells. Despite the potential efficacy and benefits of these new cancer therapies, there is an urgent need for accurate biologic and clinical markers that can assist clinicians in predicting outcomes, given the considerable variation in response among patients.¹</p> <p>It is well known that sex affects immune responses to both foreign and self-antigens, and preclinical and clinical results suggest that sex may also influence the efficacy and tolerability of targeted or immunotherapies in patients with advanced solid tumors.²</p> <p>In 2019, Conforti et al.^{3,4} showed that women with non-small cell lung cancer (NSCLC) benefited significantly more than men from the combination of immune checkpoint inhibitors (ICIs) plus chemotherapy, while men gained a survival benefit when treated with ICIs as monotherapy. Based on these findings, their subsequent research focused on identifying molecular differences in the anticancer immune response and the mechanisms utilized by tumors to evade the immune system in individuals with early-stage NSCLC.⁵ Additionally, they experimentally validate the hypothesis that sex hormones may play a role in malignancies that are not typically considered hormone-sensitive, leading to novel insights in the field.⁶</p> <p>Despite such relevant differences between men and women, randomized clinical trials (RCTs) seldom analyze and report sex-based differences in the presentation of disease, progression, and adverse events, and regulatory authorities' efforts to promote this had obtained only limited success so far.⁷ The under-representation of women in RCTs is the first factor contributing to this issue. Pala et al.⁸ reported in 2022 that only 6,664 (33.6%) patients among 19,859 enrolled in 33 RCTs evaluating ICIs in advanced solid tumors were women, and that this proportion was consistent across different tumor types. Although some differences in the lifetime probability of being diagnosed with certain non-reproductive cancers exist between men and women⁹, they do not fully explain the significant discrepancy in RCTs' enrollment sex ratio.</p> <p>To enhance the orientation of future studies on newer anticancer agents towards personalized therapies based on sex, and to establish more robust evidence confirming sex as a predictive factor, a continuous review of the existing literature</p>

	<p>is essential. It has been shown that only a limited number of systematic reviews are regularly updated post-publication, which can result in incomplete or erroneous conclusions if new research is not considered.¹⁰ Therefore, it is crucial to continually assess and include newly available research in systematic reviews to ensure accurate and up-to-date conclusions.</p> <p>The aim of this project is to comprehensively update the fragmentary systematic reviews and meta-analyses on sex-based differences in targeted and immunotherapies response for solid tumors published so far. To gain more robust and convincing evidence, this large-scale project will be developed in the context of a living systematic review, an emerging structured approach in which meta-analytic results are frequently and regularly reprocessed to include the new evidence available.¹¹</p> <p>The determination of which therapies and/or combinations of therapies are more successful in treating women than men, and vice versa, is the final goal, which could be of direct value to policy makers and clinicians for informed decision making about these advanced treatments to improve patients' health, and which could serve as a basis for regulatory authorities to emphasize the importance of generating evidence that considers sex as a crucial predictive factor.</p> <p>Moreover, findings from this project might encourage researchers to design clinical trials on novel cancer therapies ensuring a larger enrollment of women, preventing the erroneous transfer of results acquired mostly in male patients to female patients.</p>
Tutor	Prof. Vincenzo Bagnardi
Mesi previsti in azienda/Expected months at the company	12
Mesi previsti all'estero/Expected months abroad	Max 6
Specific IPR rules: standard	

Public Health Epidemiology, Statistics and Economics

<p>Progetto di ricerca Research project</p>	<p><i>“Monitoraggio e valutazione della qualità dei servizi erogati dal sistema di Emergenza-Urgenza all’interno del territorio della Regione Sardegna (Italia)” - PUBLIC. 10</i></p> <p><i>“Monitoring and assessment of the quality of services provided by the Emergency-Urgent Care system in Sardinia (Italy)” - PUBLIC. 10</i></p>
<p>Tipo Type</p>	<p>Borsa finanziata da ente esterno D.M. 117/2023</p> <p>Scholarship funded by external body D.M. 117/2023</p> <p>Azienda Regionale Emergenza Urgenza Sardegna</p>
<p>Borse Scholarships</p>	<p>1</p>
<p>Abstract</p>	<p>ITA</p> <p>L’assistenza sanitaria in Emergenza-Urgenza (EMUR) rappresenta una delle maggiori sfide della gestione sanitaria e riveste un ruolo cruciale all’interno della valutazione della qualità dell’intero Servizio Sanitario Nazionale. In Sardegna è stata istituita nel 2014 l’Azienda Regionale dell’Emergenza e Urgenza della Sardegna (AREUS) con l’obiettivo di garantire, gestire e rendere omogeneo nel territorio della Regione la componente pre-ospedaliera ed ospedaliera di soccorso sanitario di emergenza-urgenza.</p> <p>Il sistema informativo per il monitoraggio dell’assistenza in EMUR è nato in risposta all’esigenza di acquisire informazioni necessarie per il monitoraggio dell’attività dei servizi di emergenza urgenza, l’analisi del volume delle prestazioni e le valutazioni sulle caratteristiche dell’utenza e sui piani di trattamento. Tale sistema informativo mira a supportare la verifica degli standard qualitativi e quantitativi dei Livelli Essenziali di Assistenza (LEA), il coordinamento integrato dei servizi svolti sul territorio dai Servizi di Soccorso Sanitario 118 e nell’ambito ospedaliero dai Servizi di Pronto Soccorso, oltre che favorire una maggiore tempestività ed efficacia dell’intervento, garantendo la continuità assistenziale delle cure a beneficio dell’assistito.</p> <p>In ultimo, la disponibilità di analisi di dati georeferenziati per la collocazione territoriale di Defibrillatori semi-Automatici Esterni (DAE) rispetto a densità abitativa, contesti viari, distribuzione/quantificazione delle richieste di soccorso per tali eventi critici può dare valore aggiunto per la realizzazione della rete di tale sistema su tutto il territorio regionale.</p> <p>Al fine di generare evidenze scientifiche che possano supportare concretamente tali attività, si necessita di metodologie statistiche ed epidemiologiche di analisi dei dati che permettano di implementare strumenti</p>

	<p>standardizzati per il monitoraggio e la valutazione della qualità della cura erogata in EMUR all'interno del territorio.</p> <p>Il presente progetto di dottorato mira a identificare e mettere in atto strumenti volti a fornire un contributo alla pianificazione dei servizi EMUR attraverso un'analisi dei dati anche in relazione al territorio ed alla dimensione geo-spaziale.</p> <p>ENG</p> <p>Emergency healthcare represents one of the most critical issues when considering healthcare management, playing a crucial role in the evaluation of the quality of the National Health Service. Thus, with the aim of ensuring, managing and standardizing the pre-hospital and hospital components of emergency-urgency medical assistance across the territory of Sardinia (a region of Italy), the regional Agency for the pre-Hospital Emergency Medical System of Sardinia (EMS – Azienda Regionale dell'Emergenza e Urgenza della Sardegna (AREUS)) was established in 2014.</p> <p>In response to the need for information necessary for monitoring the activity of emergency-urgency healthcare, the analysis of the volume of services and the evaluation of the characteristics of users and treatment plans/pathways/procedures, a specific information system for monitoring assistance in EMS was developed/implemented. This information system's aims to support the assessment of the qualitative and quantitative standards of the Essential Levels of Assistance, and the integration of services provided by the territorial "118" Healthcare Services and by the EMS within the hospital environment, as well as favoring more timely and effective interventions in order to ensure continuity of care for patients.</p> <p>The availability of georeferenced data analyses for the locations/positioning of semi-automatic external defibrillators (AEDs) across the region based on population density, road contexts, distribution and quantification of requests for assistance in critical events can provide an added value to the implementation of this system throughout the regional borders.</p> <p>Statistical and epidemiological methods of data analysis are needed to generate scientific evidence that can be used to support these healthcare activities. Standardized tools can/should be developed to monitor and evaluate the quality of care provided within the territory of EMS.</p> <p>This PhD project aims to identify and implement tools that will contribute to support the EMS planning and management through the analysis of data related to the territory and geo-spatial dimension.</p>
Tutor	Prof. Matteo Franchi
Mesi previsti in azienda	18

Expected months at the company	
Mesi previsti all'estero Expected months abroad	Max. 6
Specific IPR rules: Intellectual property clauses agreed with the Company apply to this scholarship	

Public Health Epidemiology, Statistics and Economics

Progetto di ricerca Research project	<i>"Melanoma prevention, detection and prognosis assessment: artificial intelligence in public health"</i> – PUBLIC. 11
Tipo Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 Istituto Europeo di Oncologia (IEO)
Borse Scholarships	1
Abstract	<p>ENG</p> <p>Background/Rational</p> <p>The incidence of melanoma is rising significantly worldwide, becoming a public health concern. From the 20th century, both incidence and mortality for cutaneous melanoma have increased among populations of European descent: age-standardized incidence and mortality rates are, respectively, 11.4 and 1.6 per 100.000/year in Europe and 16.6 and 1.1 in United States (GLOBOCAN, 2018).</p> <p>Prevention</p> <p>Skin cancer prevention requires a comprehensive approach starting from primary prevention, through behavioral changes, to secondary and tertiary prevention.</p> <ul style="list-style-type: none"> • Primary prevention consists of observing good sun exposure norms: avoiding over-exposure, exposing only with sunscreens appropriate to each specific phototype. • Secondary prevention through the examination of any atypical or doubtful lesions found on the skin allows melanomas to be diagnosed at an early stage. In fact, self-examination and periodic mole mapping with dermoscopy are recommended. • Tertiary prevention, on the other hand, concerns patients with previously diagnosed melanoma; it is important to undergo follow-up examinations to detect any recurrence early. <p>Diagnosis</p> <p>Measuring the effectiveness of primary prevention measures is undoubtedly complicated and results of initiatives to induce change in health behaviors have been less convincing beyond the shorter term. Thus, early diagnosis of cutaneous melanomas, especially for high-risk subjects, is encouraged to lower morbidity and death. However epidemiological studies addressing the causal relationship between early diagnosis and mortality are difficult to implement: it is hard to know whether increased melanoma surveillance reduces mortality and whether such an approach is cost-effective (Gilmore, 2017).</p>

The identification of suspicious pigmented lesions, which may be a sign of skin cancer, has traditionally been done by visual examination by doctors. However, KOH, Barbato, F. et al. (Giuseppe Argenziano, 2006) showed how the use of dermoscopy improves the ability of primary care physicians to triage lesions suggestive of skin cancer without increasing the number of unnecessary expert consultations. The prognosis for melanoma can be improved, and the cost of therapy can be greatly decreased, by such early-stage suspicious pigmented lesions identification in primary care settings. Due to the large number of pigmented lesions that frequently need to be assessed for prospective biopsies, it might be challenging to identify and prioritize suspicious pigmented lesions promptly. Artificial intelligence and deep convolutional neural networks (DCNNs) can help to analyze and classify suspicious pigmented lesions.

Aims of the project

This project is focused mainly on application of AI to melanoma images in order to improve secondary and tertiary prevention. In addition, to identifying high-risk individuals who might be the subjects of screenings, research on risk factors that could affect the efficacy of primary and secondary preventive measures will be carried out from the MSKIP pooled study.

Analysis and Methods

Systematic reviews and meta-analyses and through collaborative studies with the Italian Melanoma Intergroup will be carried out. Artificial intelligence methods and classical multivariable methods will be compared also to investigate prognostic and predictive factors to assess the effectiveness of new oncological therapies.

Handcrafted methods

After preprocessing the images to reduce the unwanted noise such as bubbles, and hair, the lesion will be segmented, meaning that the significant region of interest (ROI) will be defined. Features will be extracted from the lesion, and skin lesions will be divided into three types: shape features, color features, and texture-based features. Classification is the last step in the CAD system to classify melanoma malignancy. Several classification approaches will be used for melanoma diagnosis: support vector machine, K-nearest neighbor, Random Forest, Artificial Neural Network and DecisionTree (Ioannis Giotis a, 2015). The information extracted will be also used to develop a prognostic model.

Deep learning application

Deep learning algorithms have been widely employed for melanoma classification recently without the requirement for domain expertise. Data imbalance and the lack of a large volume of labeled images have slowed the use of deep learning methods in skin cancer classification (Manu Goyal, 2020). In terms of supervised learning, we will build a convolutional neural network and train it with a set of labeled images (benign or malignant, or a mutation or 1-year survival rate). Alternatives involve the use of pre-trained neural networks. A pre-trained ConvNet is a previously trained network that is usually trained on a large image classification task. Learning features across different problems is a key advantage of deep learning compared to the

	<p>shallow-learning, and this makes deep learning very effective for small data problems. These pre-trained networks will be used to extract information. One option is to use the network without further training, but with the availability of computational resources, it is instead possible to conduct further training on the images that the models is built to classify. Several different deep learning approaches will be investigated in the field of secondary and tertiary melanoma prevention.</p> <p>Expected results Easy access to skin exams will increase the possibility of accurate and prompt identification of melanoma, and computer-assisted diagnosis will have a crucial role in reaching this goal. Artificial intelligence applied to imaging data will be more and more applied with the objective of enhancing the identification of malignancy, predicting different prognoses and identify the best treatments, for melanoma but also for other cancer sites. We will integrate artificial Intelligence results, which has the capability to discover the invisible and complicated relationships inside a variety of imaging data, with clinical data to improve application of this information in clinics.</p>
Tutor	Prof. Vincenzo Bagnardi
Mesi previsti in azienda Expected months at the company	12
Mesi previsti all'estero Expected months abroad	Max. 6
Specific IPR rules: Intellectual property clauses agreed with the Company apply to this scholarship	