

REVIEW

by Assoc. Prof. Dr. GENA GEORGIEVA PENKOVA, PhD

for the dissertation of Nadezhda Bozhidarova Mihaylova-Georgieva, PhD student in an independent form of education in the doctoral program "Public Health Management" for awarding the educational and scientific degree "Doctor" in the field of higher education 7. "Health and Sport", professional field 7.4. "Public Health", in the scientific specialty "Public Health Management".

By Order No P-109-23/29.01.2024 of Prof. Dr. SVETOSLAV GEORGIEV, MD, PhD - Rector of Medical University "Prof. Dr. Parashkev Stoyanov" – Varna, I was selected as a member of the Scientific Jury under the procedure for acquiring educational and scientific degree "Doctor" in the scientific specialty "Public Health Management" with a candidate **Nadezhda Bozhidarova Mihaylova-Georgieva**, PhD student in an independent form of training in the doctoral program "Public Health Management" with a dissertation titled **"Infant mortality in Bulgaria - health-political and cultural-historical aspects"**. On the basis of Protocol No 1/08.02.12.2024 and Protokol No 2/21.01.2021 I have been appointed to prepare a review under this procedure.

Biographical data and career development of the PhD student

The PhD student **Nadezhda Bozhidarova Mihaylova-Georgieva** was born in the town of Varna. In 2000, she graduated from the Frédéric Joliot Curie Language School with a foreign language profile in French, then she continued her education at the College of Tourism with the acquisition of higher education "Specialist". In 2006, she acquired a Master's degree in International Relations from Varna Free University "Chernorizets Hrabar". In 2017, she acquires a second Master's degree in the specialty "Public Health" at the Medical University "Prof. Dr. Paraskev Stoyanov" – Varna. From November 2018, she started a postgraduate education as a PhD student in an independent form of training for acquiring the educational and scientific degree "Doctor" in the scientific specialty "Public Health Management" at the Department of Social Medicine and Health Care Organization at the Faculty of Public Health of the Faculty of Public Health. Since 2023, she started a training in the third master's degree in "Artificial Intelligence in Biomedicine" at the same institution.

She has held various positions and since 2018 she has been working as an organizer at the Department of Health Care at the Medical University - Varna. In this position, in addition to her current duties, she has done tremendous work on the organization and prepress of the materials of a number of international conferences. She has participated in 4 scientific projects related to current health issues. Since 2023, Nadezhda Mihaylova is a part-time lecturer at the Department of Social Medicine and Health Organization with participation in the teaching of three disciplines: Introduction to Public Health, Information Systems and Technologies, and Introduction to Health Informatics.

The most characteristic of the PhD student Nadezhda Mihaylova is her continuous striving for improvement and acquisition of new knowledge and skills in accordance with the modern development of science and technology. In the last 6-7 years, she has participated in 23 thematic courses, seminars, webinars (most of them online and in English), which are related to current health and management technologies, acquiring skills for effective work with databases, systematic analysis

and management technologies, acquiring skills for effective work with databases, systematic analysis of literary information, mastering new research approaches and software products, etc. The acquired broad-spectrum knowledge and skills, her good command in foreign languages (English at certificate level B2, French, Spanish and Russian), her excellent computer skills, her two completed master's degrees and the training in a third master's degree are a solid basis for the development of this dissertation.

She is a member of the Bulgarian Society of the History of Medicine, NGO "Public Health - 99", Bulgarian Public Health Association, European Association of Public Health and World Federation of Public Health Associations.

General characteristics of the dissertation and its relevance to the topic

In its volume and structure, the dissertation fully complies with the requirements for acquiring the educational and scientific degree "Doctor". It contains 154 pages (equal to 172 standard pages of 1800 characters). The main text is structured in four chapters: 1. Literature review; 2. Purpose, tasks, hypotheses, methods; 3. Results and discussion; 4. Conclusions and contributions. It contains a bibliography and 6 annexes.

Relevance to the topic of the dissertation. The PhD student has directed her scientific interest to a problem, the relevance of which is very well justified in the introduction. What puts infant mortality in our country among the most current problems of social development? First, on the background of the significant decrease in infant mortality in European and other developed countries, what has been achieved in Bulgaria ranks Bulgaria in an unfavorable position. Second, the observed inequalities in infant mortality by region, ethnicity, education and other factors require new research and the adoption of relevant health policy actions. Prematurity and complications of premature births are leading causes of neonatal mortality, which accounts for nearly 50% of all deaths by age 5. Even in countries with high technological equipment and qualified staff for intensive care, the role of the human factor is invaluable. In our country after 1990, an increase in the incidence of births at too young age and the increase in the proportion of those born prematurely with low birth weight was observed. The struggle for the survival of every premature child acquires an even higher social cost in the conditions of the deepening demographic crisis in the country.

Evaluation of the structural parts of the dissertation

Evaluation of Chapter I. The literature review is presented on 46 pages and occupies 30% of the dissertation. Structurally, the review is divided into 10 parts, arranged in a logical sequence, starting from a historical look at child mortality and ending with modern infant mortality surveys.

In a short and concise presentation, the PhD student brings us back to interesting data on the situation of children over the centuries and the first attempts to measure mortality before the introduction of the mandatory registration of vital events in the middle of the 19th century in United Kingdom, followed by the Scandinavian countries. The merit of William Farr in recognizing the importance of statistics, the role of the church in keeping records of the born and the deceased, the role and responsibility of midwives were emphasized.

The literature review provides an in-depth analysis of the importance of infant mortality as an indicator of social and health well-being on a global, regional and national scale. Early data on infant mortality dynamics in the second half of the 19th century and early 20th century were well traced.

Interesting information, based on solid scientific publications, about the role of various organizations, institutions and individuals in the fight against infant mortality is presented, citing examples from France (Pierre Buden), Great Britain (Sir George Newman), USA, Henry Copplick, Lillian Woyd), Russia (earth doctors, children's health care stations), Germany (institutions for stimulating breastfeeding), Italy, Finland and others.

Central to the literature review was the discussion of the determinants of infant mortality, the role of poverty and malnutrition. Important focus has been put on the characteristics and mother's behaviour, through whose personality, according to Newman, the impact of all other social factors is manifested. This led to the widespread adoption of the term "motherhood" in all European countries. The PhD student expands the analysis of contemporary publications in which the determinants of infant mortality are classified at the individual, interpersonal, organizational, community and socio-political levels. The focus of research in recent years on inequalities in infant mortality is emphasized, highlighting the importance of integrating the Roma population.

The section dedicated to combating infant mortality in Bulgaria in the period 1920-1944 is of great interest. The PhD student uses information from important archival documents for the establishment of the Union for the Protection of Children in Bulgaria as a branch of the International Union for the Protection of Children, the establishment of the first children's ward in Bulgaria, the establishment of health and counselling centers and their role in the health and educational activity, attracting teachers in the villages as advisors on children's health issues. An exceptional role of prof. Stefan Vatev for the introduction of early positive practices in child health care was well recognised. The literature review concludes with a summary of current guidelines in infant mortality studies, much of which has been used further in the discussion of own data in the third chapter of the dissertation.

I highly appreciate the literature review, which convincingly proves the skills of the PhD student in working with databases, extracting information from appropriate sources and performing a thorough systematic analysis. The review is based on an impressive number of 218 literary sources (79 in Cyrillic and 139 in Latin), presented in the bibliographic according to the requirements and quoted fully in the text with the names of the authors and years. For each source from the Internet, site, title, author(s), date of access and download are indicated. The review is written in impeccable academic style and with excellently formulated conclusions.

Chapter II presents the methodology of the study. The aim of the study is briefly and clearly formulated: *"To study the dynamics of infant mortality in Bulgaria in a health and political context for the period 1950-2020 and to assess the role of cultural and organizational factors in achieving favorable trends."*

For the realization of this goal, 5 specific tasks are indicated, pointing out the individual steps of the study: a study of infant mortality historically with a focus on the practices of lowering indicators in Bulgaria, Europe and the United States; tracking the dynamics of infant mortality in Bulgaria and other European ones for 1950-2020; analysis of the regional differences in the dynamics of infant mortality in Bulgaria in the last two decades; study of the readiness of women from different educational and ethnic groups in Bulgaria for childbirth and care in early childhood; assessment of the possibilities of cultural and health and organizational factors for improving the trends of infant mortality.

Six research hypotheses have been formulated clearly and precisely. **The study design** includes **four interrelated studies** that provide complexity of the study and analysis:

1. Theoretico-historical study of trends in the development of scientific ideas and approaches to the problem of infant mortality. The PhD student has carried out a systematic analysis of literature sources extracted from solid databases through relevant keywords. The knowledge of four foreign languages has allowed the PhD student to reach extremely valuable publications describing very well the changes in public views on childhood and the situation of children in different periods, the emergence of organized forms of care for the health of children at an early age and their impact in Bulgaria.

2. Comparative study on the trends of infant mortality in Bulgaria in European context, including: first, a comparative analysis of basic infant mortality indicators (total, early and late neonatal, and postneonatal mortality) in selected European countries and the place of Bulgaria in a prolonged 70-year period (1950-2020) according to Eurostat data; second, a comparative analysis of the regional differences in infant mortality using data from the National Statistical Institute and calculated by the PhD student herself coefficients for six regions according to the second level of regional distribution of the country for the period 2000-2019.

3. Quantitative sociological survey through a Google questionnaire form to assess mothers' readiness for childbirth and childcare in the first year to which 249 women responded.

4. Qualitative study of the importance of ethnocultural factors through an in-depth interview with 11 Roma mothers. The PhD student defined 10 topics of discussion in order to reveal the specific characteristics in respondents' behaviour during pregnancy, before birth and during the first year of life of the children. Responses were recorded with the consent of individuals, transcribed and aggregated by an appropriate method for identifying, analyzing, and reporting qualitative data.

A distinctive feature of the dissertation methodology is the complex approach and detailed study methods: well-selected European countries for descriptive study; well prepared questionnaires for the quantitative survey; well-formulated areas of discussion in the in-depth interview.

The assessment of Chapter Two is very positive. I don't have any notes. The overall study design proves the PhD student's in-depth knowledge and mastery of modern methodological approaches in the field of socio-medical and cultural-historical scientific research.

Evaluation of Chapter Three "Results and Discussion". This chapter occupies 40% of the dissertation. It consistently presents the results of the 4 studies. Its content is enriched with 10 perfectly crafted tables (without the 3 tables in the annexes) and 19 statistically sound figures.

The comparative analysis of infant mortality in Bulgaria in the European context for the period 1950-2020 begins with introductory remarks in which the PhD student emphasizes that Bulgaria ranks in the group of European countries with the highest infant mortality (along with Hungary, Portugal and Romania) during the first half of the 20th century. In the further in-depth analysis, the PhD student proves with specific data Bulgaria's place among 28 European countries in the period 1960-2020, which outlines two different trends. In the first three decades, although unevenly, a significant decrease in all infant mortality indicators (total, neonatal, early neonatal) was achieved.

The PhD student correctly points out the role of health and political factors in this process. First of all, this is associated with the introduction of the legislative framework for the social

protection of maternity and childhood (introduction of free medical care for pregnant women and children; provision of qualified health and preventive care; creation of children's and women's consultations in the cities and mobile ones in the villages; disclosure of children's dairy kitchens; promoting the principles of proper child nutrition and maternal education, etc.).

Secondly, the establishment of the national health system with priority for maternal and child care; neonatal wards at obstetrics and gynecology clinics / wards for newborns at increased risk; introduction of mandatory discussion of each infant death by competent regional committees; compulsory patronage monitoring of newborns, etc.

Socio-economic and political changes since 1990 have been accompanied by prolonged stagnation and deterioration of infant mortality indicators: Bulgaria occupies an unfavorable place in the level of infant mortality among the compared 28 European countries; has a lower gross domestic product; some changes occur in the health system: shift to the general practitioner model (who is often not a paediatrician); the immunization rate among children decreases, especially in Roma population; increase in early births and incidence of premature babies and newborns with low birth weight increase; etc.).

In this section, the PhD student Nadezhda Mihaylova-Georgieva demonstrates excellent skills in extracting and analyzing information from large databases, building her own tables and graphic images, and formulating conclusions based on solid evidence. **The analyzed specific data confirm the first and second hypotheses** that Bulgaria follows the European trend of decreasing infant mortality in the period 1950-2020, but in the period of transition 1990-2000 the general and specific indicators of infant mortality have increased.

The **analysis of infant mortality at regional level for the period 2000-2020 is innovative and contributory**, which allows to reveal significant health inequalities in infant mortality rates and factors. The European approach to studying regional health inequalities is applied. A detailed comparison of all indicators related to infant mortality (total infant mortality, early and late neonatal mortality, postneonatal mortality, stillbirth and perinatal mortality) was carried out for the 6 socio-economic regions introduced in 2000.

According to all compared indicators, the **Southwest region** (including Sofia) is characterized by the most favorable levels and a long-lasting tendency to maintain the ratio to the other five regions throughout the 20-year period. Early neonatal mortality in this region is near, and in some cases even more favourable than in the European countries. Conversely, the **Southeastern** region has the highest rates of early neonatal mortality.

The same dependencies are observed regarding the late neonatal mortality, but with a tendency to reduce the differences between the lowest and highest values for individual regions. Special attention has been paid to **Northeast region**, where late neonatal mortality has decreased significantly and is ahead of other regions in the country in terms of declining.

In postneonatal mortality, the ranking by region is maintained the same, but the differences between Southeast and Northwest regions compared to Southwest and the other 3 regions with lower levels are more pronounced. Despite the downward trend of postneonatal mortality in all regions, the of interregional disparities since 2010 have been deepening. The ranking of regions by stillbirth and perinatal mortality rates is similar. The PhD student correctly appreciates that the stillbirth rate reflects to a large extent the quality of outpatient care in the monitoring of pregnant

women and, above all, the timely identification and monitoring of risky pregnancies. This indicator maintains a fairly stable level throughout the whole 20-year period for all regions. As a result of this trend, even with a decrease in early neonatal mortality, the level of perinatal mortality remains relatively high.

Quite impressive is the depth of reasoning in the search and justification of interregional differences not only through the role of economic factors, but also the delineation of differences in the technical, organizational and personnel provision of the functioning of health facilities in the compared regions. All trends and dependencies convincingly confirm **the third research hypothesis for the presence of permanent regional inequality in the levels and trends of infant mortality in Bulgaria.** Such a comprehensive analysis of interregional differences in infant mortality has been conducted **for the first time** in Bulgaria and is of a pronounced contributory nature.

The third study is aimed at revealing the role of the different units of the health system in supporting mothers to provide complete care for children up to 1 year. The group of respondents to the online survey include mothers with a higher educational level and greater completeness and credibility of the information collected. The questions concerns an assessment of activities provided by the main units of the health system related to pregnancy, childbirth and raising children up to 1 year such as women's consultation, maternity hospital, children's consultation and care in the home.

The majority of respondents have attended a women's consultation, received advice about their behavior during pregnancy, but judged as insufficient the advices provided after the childbirth and advices on breastfeeding and dealing with possible breastfeeding problems. A significantly higher rating has been given for the provision of information and comprehensive care for mothers in private hospitals.

Home visits of the newborn and the advices provided by the doctor were carried out in accordance with the Child Health Program. Children's consultation was considered as very useful. Nearly half of the respondents believe that the nurse visits at home would be very useful and it would be good to restore the practice of patronage visits.

All the results of the quantitative study are supported by the application of appropriate statistical methods to compare and verify the significance of conclusions.

A qualitative study through in-depth interview deserves a high evaluation. It allows to extract valuable information about the influence of ethno-cultural factors in Roma mothers. The well-defined areas of discussion, the skillful conduct of the interviews, the transcription of the recordings and the derivation of appropriate categories for analysis allow to outline a number of important characteristics and peculiarities in the care for children up to 1 year among the Roma community: a younger age of the participants in the in-depth interview and a much lower educational level compared to those who responded to the online survey; significantly higher number of children and early age of birth of the first child; different religious affiliation; presence of language barriers; differences in social living conditions and employment; respect for and satisfaction with the work of women's consultation; preference for childbirth in a state or municipal hospital; insufficient advice received in maternity wards; sharing cases of negative attitude of staff towards them; unawareness and differences with regard to the first examination of the newborn

after discharge from the maternity ward; respect for the role of children's consultation; placing the health of children as an important problem and seeking medical help in case of illness; availability of family-family support in child care; divergent advice and practices on power supply; the imposition of certain obsolete practices; distrust and predominance of opinion that belonging to the Roma ethnicity is a reason for poor attitude by medical staff before and during childbirth, as well as after childbirth; a pronounced need for training mothers and families on specific childcare up to 1 year; need for closer and more frequent contact with representatives of the health service.

All conclusions from the in-depth interview are supported by original quotes from transcribed recordings, which gives greater credibility.

The presentation of results from all four studies is extremely rich and thorough. It is especially valuable that all conclusions are compared with other publication and authors cited correctly with the names and years of the publications. On the basis of such detailed results and established trends, the doctoral student makes a meaningful summary (discussion), in which she clearly confirms the research hypotheses formulated in the methodology:

- Bulgaria follows the European trend of decreasing infant mortality in the period 1950-2020. The transition period 1990-2000 has been problematic.
- Since 1990, Bulgaria has lagged behind other European countries in terms of general and specific infant mortality indicators.
- Persistent interregional inequality in overall infant mortality rates and in specific indicators exists.
- The main factor for the formation of readiness of mothers for childbirth and child care up to 1 year of age is the health service.
- There are educational, ethnic, and cultural differences in maternal awareness and behaviour.

Only the fourth hypothesis stated that "the determinants of inequalities by place of residence and between districts are equally determined by socio-economic, cultural and organizational factors" could be partially confirmed due to the difficulties in quantifying the impact of individual groups of factors.

I greatly appreciate the overall presentation and in-depth discussion of the results in Chapter 3, which allows a logical transition to Chapter IV in which **11 convincing conclusions**, reflecting very well the main study results and being in great harmonization with the title of the dissertation itself, dedicated to health-political and cultural-historical aspects of the problem of infant mortality in Bulgaria.

I accept and confirm the **theoretical and practical contributions** presented by PhD student, which fully correspond to my assessment of individual structural parts of the dissertation. I even believe that the PhD student has shown unnecessary modesty in outlining her contributions.

The abstract reflects very well the full content of dissertation and presents very well the methods for extracting and collecting information through specific scientific approaches, summarizing the results, and formulating well defined conclusions and contributions. Based on the dissertation, three full-text publications have been made in appropriate scientific journals.

My overall assessment of the dissertation is very high. The work is written in a very good academic language in compliance with all requirements for volume, structure and presentation of the methodology and the results of the studies.

The dissertation of the PhD student Nadezhda Mihaylova represents a fully completed scientific work that traces very well the international and Bulgarian experience Bulgaria to reducing the infant mortality and demonstrate important and insufficiently evaluated aspects of the problem in the European context. I highly recommend the publication of this work in the form of a monograph, which will make the results available to the general scientific public.

Conclusion

The dissertation is a result of a thorough research process on a topical problem. The work has been developed extremely accurately, at a high scientific level, using a wide range of well-selected sources of information for analyses of health-political and cultural-historical aspects of infant mortality. A contemporary study design was applied. The results have been analyzed thoroughly in full accordance with the formulated goal, objectives and research hypotheses. The dissertation paper contains evidence-based theoretical and practical contributions. The overall layout of the dissertation proves the excellent capabilities of the doctoral student to conduct independent research work.

The dissertation "**Infant mortality in Bulgaria – health-political and cultural-historical aspects**" fully meets the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria and the Regulations for its application, as well as the Rules for the Development of Academic Staff at the Medical University - Varna. I highly appreciate the dissertation and propose to the distinguished members of the Scientific Jury to vote positively for awarding the educational and scientific degree "Doctor" to **Nadezhda Bozhidarova Mihaylova-Georgieva** in the scientific specialty "Public Health Management", field of higher education 7. "Health and Sport", professional field 7.4. Public health.

Reviewer:

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Assoc. Prof. Gena Georgieva Penkova, MD, PhD

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