Final Report Summary - EUNAM (EU and North African Migrants: Health and Health Systems)

Executive Summary:
EUNAM (EU and North African Migrants: Health and Health Systems) was funded under the European Union's 7th Framework Program for 4 years with the starting date on April 2011 and a total budget of close to €2 million. The project was summarized: "The coordinates of human health are complex even in a single population but they are even more complex in migrants whose life situation is always influenced by the host country and the country of origin. Some migrants may experience several host countries and some return to the country of origin. Thus it is important to survey wellbeing, health status, disease panorama and use of health services of immigrants compared to the native population; such analyses would be incomplete without casting a view on the same indicators and parameters in the country of origin". The partners were a team of experts covering health aspects of the full cycle of migration, viewing the health situation in Egypt, Tunisia and Morocco as representatives of the Mediterranean North African (NA) partner countries, the origins of vast numbers of immigrants in the European Union (EU). The EU partner countries from France, Italy, Germany and Sweden are not only receivers of the NA immigrants but they also have large numbers of immigrants from others areas, allowing comparisons between immigrant groups. The team had experience on a variety of health and disease measures and it had access to a variety of survey and register material relating to population health, disease patterns and function of health care systems. The team has been in the position to respond to the expectations of the call by reviewing health effects of migration from the country of origin to the host country and coming up with scientifically valid state-of-the-art evaluations published in some 50 articles.

The studies show that immigrants are a vulnerable population experiencing in some aspects discrimination and hardship similar to the socially weakest national population groups. Immigration has changed the disease spectrum, particularly in infectious diseases and recessive conditions such as sickle cell disease and familial Mediterranean fever. Importantly, health questions of immigrant cannot be separated from those of any human health issues. The conducted studies in immigrants have advanced our understanding of disease
aetiology and epidemiology in many ways. In the course of these scientific considerations, it has become increasingly clear that immigrant health issues are no different from those of natives as these are germane to human health.

In EU the massive internal movements are very recent and the social consequences of which are not well known. Even if some legislation is meant to guarantee equality for all EU citizens it is likely that in due time problems related to social and health issues arise which remind of those in immigrants from outside EU, surveyed by EUNAM. It is important to survey social and health issues of the ‘old’ immigrants and the ‘new’ inter-EU immigrants. In any population, migrants are always a minority and national funding for immigrant questions is very limited. EU should therefore open dedicated funding opportunities on migrant health-related themes covering both the ‘old’ and the ‘new’ immigrants.

Project Context and Objectives:
The studies conducted by EUNAM (EU and North African, Migrants: Health and Health Systems) show that immigrants are a vulnerable population experiencing in some aspects discrimination and hardship similar to the socially weakest national population groups. Immigration has changed the disease spectrum, particularly in infectious diseases and recessive conditions such as sickle cell disease and familial Mediterranean fever. Importantly, health questions of immigrant cannot be separated from those of any human health issues.

In the original application the EUNAM project delineated its task as “...it is important to survey wellbeing, health status, disease panorama and use of health services of immigrants compared to the native population; such analyses would be incomplete without casting a view on the same indicators and parameters in the country of origin”. In below summary the project is described by work package (WP) described in the original work description. In this final report we summarize the results and conclusions of the numerous scientific articles that EUNAM partners have published under the auspices of this funding scheme. The references to the EUNAM papers are found in section on the main S & T results.

Health and biological and psychosocial well being of NAn immigrants in EU vs. natives and other immigrant groups (WP1)

Epidemiological data show that the generally good health status of immigrants (“health immigrant effect”) declines after their arrival in the new country. Stress and factors linked to a new life-style can partly explain the deteriorating health status of the immigrant population and the emerging risks of diseases such as cardiovascular disorders, diabetes mellitus and asthma. An EUNAM study presented the ‘healthy migrant selection effect’ which postulates that migrants have a better health status than their countrymen, because only those in the best health emigrate while unhealthy migrants may also be more likely to return in their home countries. This health selection at migration could explain the better health status of immigrants.

Despite the alarming effects of obesity on health, economy and society, national strategies to combat obesity do not exist in NAn countries. Thus far, obesity has not been recognized as a major public health priority, and convincing policy makers about the need to prioritize action to prevent obesity will be a crucial first step.

In general, all immigrant groups participate in sporting activities less frequently than the native population. This can be ascribed partly to cultural differences in sports participation among ethnic groups and between men and women, as women participate in sports less frequently than men. Since overweight and obesity reflect an energy imbalance, the main areas of intervention are dietary intake and energy expenditure, for which the main modifiable component is physical activity.

As overweight and obesity in childhood are associated with serious health risks, it is important to target the most at risk groups (i.e. daughters of immigrants) with health promotion messages and lifestyle intervention strategies aimed at preventing overweight, e.g. promotion of a healthy diet, information on the health risks linked to overweight and obesity and on the role of physical activity in weight control.

The Swedish data on the country of parental birth and pregnancy outcome indicators of small-for-gestational-age and prematurity suggested increased risks particularly for mothers born in Africa and in Asia. The authors recommended that maternity care should pay a special attention to pregnancies in certain underserved population groups including immigrants from defined areas.

Disease panorama in immigrants compared to natives: guide to prevention and etiology (WP2)

Many studies have shown a relative decline in the health status of the immigrants compared to the native population. For example, the
morbidity and mortality from coronary heart disease is higher among immigrants than in the majority population even when the results were adjusted for level of education and employment status. However, it has not been possible to draw definite conclusions as to whether these high-risk levels originated from the country of birth or whether they were the result of migration or the acculturation process, which has been a weakness in many epidemiological studies on migration.

Changing patterns in communicable disease transmission and emergence in Europe require a constant surveillance but remains non-harmonized between EU member states. Communicable disease among migrants is an issue that must be tackled on multiple fronts by the EU governments, public health agencies, and health institutions. The WHO describes four Axes in the Global Action Framework (2010) which delineate a comprehensive outline for public health authorities, including increasing awareness, creation of evidence-based public health policies, vaccination prevention strategies, and screening. Targeted screening for migrants arriving from highly endemic countries can serve as a front-line defense that identifies the groups most at risk for increasing national prevalence levels, while also being cost-effective in nature. This can be followed by preventative vaccination programs, which seek to concentrate resources on those who need it most. A successful integration of migrants into the local health care system ensures that disease cases are diagnosed and treated, which helps to define the proportion of national incidence cases that are directly attributable to migrants. Next, the creation of partnerships between public health agencies and local health facilities in order to ensure the management and follow-up of migrant cases once they have integrated the health care system, an essential aspect for communicable diseases with long latency periods. Finally, the diffusion of national educational campaigns as a form of transmission prevention, which target migrants and second-generation children of migrants at risk of contracting a disease when traveling back to their home country.

The Swedish on hospitalization for type 2 diabetes demonstrated increased rates in first-generation African men and particularly women born in Asian and Chile. However, as the risks appeared to disappear in the second-generation, he authors to conclude that the risk factors were mainly environmental. The authors speculate that socioeconomic disadvantage plays a role in the development of diabetes among the immigrant groups at risk. The assumed risk factors include obesity, dietary fat intake, smoking, and low levels of physical activity, of which obesity and lack of physical activity have been a repeated theme in EUNAM survey. An important message is that these are modifiable risk factors but preventive measures need a special targeting at vulnerable immigrant groups.

NA has been a main source of European immigrants and the disease alleles have been introduced to the national gene pools. However, for recessive diseases the most frequent disease manifestations are in inbred immigrant populations. It remains unclear how well European health care providers are able to cope with the imported diseases. The example of periodic fever syndromes showed that a new disease may be introduced into immigrant-dense countries with little notice by the medical community. Diagnostics of recessive disease require demonstration of specific mutations in target gene. Thus knowledge of the common founder mutations in ethnic immigrant populations is required and diagnostic tests used in NA could be applied.

Health care utilization by immigrants compared to natives (WP3)

EUNAM partner Dourgnon at IRDES, Paris, has conducted French population health surveys on representative population sample showing that immigrants have a lower rate of access to private practice ambulatory care of both general practitioners and specialists compared to the rest of the French population. These differences pertain to immigrants’ relative disadvantaged social conditions, including education, income and access to complementary insurance. Most of the observed differences disappeared once the socioeconomic characteristics were adjusted in the analysis. The survey showed a more contrasted situation in terms of preventive care; immigrants more often declared being vaccinated but more seldom used screening tests.

Population well being and health care in NA with time trends (WP4)

In the last twenty years, an increase in overweight and obesity in children and adolescents has been observed in both developed and developing countries. In developed countries, children of immigrants seem to be particularly at risk. In most developing countries, urbanization is a major factor involved in the high prevalence of obesity. Despite widespread poverty in NAn cities, there is easier access to cheap foods with high fat and sugar contents among the urban poor than among the rural population. A more industrial diet has been replacing their traditional diet. Although total energy intake is higher in rural areas, it has a lower contribution from fats and animal products. Calorie expenditure is also higher in rural people due to agricultural work and lower use of transportation systems; by contrast, urban people ride motorcycles, cars or buses. Therefore, urbanization, aging and the socioeconomic level have been considered the main determinants of low physical activity levels in NAn populations. Accelerated urbanization and altered dietary and lifestyle patterns have caused a progressive increase in cardiovascular risk factors such as obesity, hypertension, diabetes and
Communicable diseases such as human immunodeficiency virus (HIV), malaria, tuberculosis (TB) and hepatitis viruses, pose a worldwide public health problem in both developing and developed nations resulting in significant mortality. The NA region is no exception to this rule, with half of reported deaths being directly attributable to communicable diseases. Vaccination programs seek to reduce prevalence levels, yet many NA countries exhibit intermediate or high prevalence for many bacterial, zoonotic, viral, and parasitic diseases. Due to pathogen adaptability, the NA region is now faced with the persistence or stagnation or even the resurgence of certain diseases, in particular, TB, hepatitis, HIV, meningitis and leishmaniasis. Migration via NA to other destinations adds another level of complexity in disease spread and impacts the health of the local population. Adequate monitoring and preventative strategies must be in place so as to mitigate the negative impact on NA residents’ health and reduce the burden on future generations.

EUNAM has discussed consanguinity in NA, and some of its deleterious consequences in indigenous and immigrant populations. The distribution of founder mutations is the result of historical migratory movements and many common disease alleles in the current NA have origins elsewhere but the disease burden in NA is largely the result of inbreeding.

The incidence rates for most cancers are low in developing countries, but for a few cancers the rates are very high. These include liver, nasopharyngeal, esophageal, stomach and cervical cancers. The causes for these cancers are usually known and they are related to microbial infections, nutritional imbalances and toxins, and the risks of these cancers tend to be high in first generation immigrants in EU. Cancer rates are high in EU for most cancers in agreement with most developed countries. The reason for the high risk is referred to as ‘western lifestyle’ and ‘affluence’ but more precisely the reason is probably excess energy intake. Overweight and obesity are risk factors for many cancers, as discussed elsewhere in this special issue. An important conclusion from the reviewed (Swedish) immigrant studies in which a large proportion of the present immigrant population had entered Sweden in their early 20s is that the cancer pattern or destiny is set before age 20 years. Those who lived in a low-risk country until adulthood remain at low risk and, vice versa, youth in a high-risk country destines a high risk for the rest of one’s life. This is highly relevant for cancer prevention which should target early years of life. In the same vein, the growing problem of obesity and excess energy intake in the developing countries will predict increasing cancer rates in some segments of the population which had traditionally low rates of cancer.

Lessons for prevention in NA, EU and the world (WP6)

The surveys conducted by EUNAM, summarized above, show that studies in immigrants have advanced our understanding of disease aetiology and epidemiology in many ways. In the course of these scientific considerations, it has become increasingly clear that immigrant health issues are no different from those of natives as these are germane to human health.

Project Results:
The EUNAM (EU and North African Migrants: Health and Health Systems) project delineated it’s task as “…it is important to survey wellbeing, health status, disease panorama and use of health services of immigrants compared to the native population; such analyses would be incomplete without casting a view on the same indicators and parameters in the country of origin”. While the EUNAM application was prepared already 5 years ago, when the Euro-Mediterranean spirit was at its peak, EUNAM has been alert to follow the events within its domain when the optimism vanished and ensuing events caused new types of immigration and health problems (9). Kassar and Dourgnon have visited refugee camps and researched on illegal migration routes (2, 16). Kassar has shown that North Africa is a transit zone for migration from Subsaharan Africa, currently and historically (17).

During its granting period EUNAM has met jointly twice annually and additionally in smaller groups discussing the thematic issues. In this final report we summarize the results and conclusions of the numerous scientific articles that EUNAM partners have published under the auspices of this funding scheme. We want to highlight the outcome by work-package (WP) described in the original work description. In the text, the numbered references (listed at the end) were publications by the EUNAM project. Other relevant literature is cited in the text.

Health and biological and psychosocial well being of North African immigrants in EU vs.natives and other immigrant groups (WP1)
Epidemiological data show that the generally good health status of immigrants ("health immigrant effect") declines after their arrival in the new country. Stress and factors linked to a new life-style can partly explain the deteriorating health status of the immigrant population and the emerging risks of diseases such as cardiovascular disorders, diabetes mellitus and asthma. The study by Moullan and Justot discussed and provided new data on the concept of 'health migrant effect' (25, these numbers refer to citations listed at the end). They presented the 'healthy migrant selection effect' which postulates that migrants have a better health status than their countrymen, because only those in the best health emigrate while unhealthy migrants may also be more likely to return in their home countries. This health selection at migration could explain the better health status of immigrants.

However, the results of Moullan and Justot challenge the existence of a “health migrant effect” in Europe. Their study was based on large datasets from National Health Interview surveys from Belgium, France, Spain and Italy providing information on self-assessed health status. The results show a large health gap in favour of natives in Belgium and France and to a lesser degree in Spain. The exception was Italy where immigrants had a better health status than natives with respect to certain communicable diseases. They point out that the findings are consistent with the results of several recent studies on immigrants as compared to natives in Belgium, France and Spain. Their findings agree with the review and conclusions of Nielsen and Krasnick, who concluded that “In regard to self-perceived health, most migrants and ethnic minority groups appeared to be disadvantaged as compared to the majority population even after controlling for age, gender, and socioeconomic factors” (International journal of public health 2010;55: 357-71). The controversies about 'health migrant effect' are probably due to the definition of 'health'. At least upon entry into the new country migrants are physically healthy, but the stress of the new social environment negatively influences self-assessed health status.

Migration leads to lifestyle, psychological, and social environmental changes, which in turn may affect nutritional status. Nutrition is an important determinant of the immigrant's health status, socio-economic condition and biological characteristics. However, little is known about the differences in nutritional and health status in the immigrant populations in EU, even though the cultural differences between the homeland and the new country of residence may be profound. Italian surveys by the EUNAM team members revealed ethnic differences in weight status, adiposity pattern and blood pressure, relating to different cardiovascular disease risk profiles in ethnic groups (Toselli S et al. Homo: internationale Zeitschrift fur die vergleichende Forschung am Menschen 2008;59: 439-52. Some immigrant groups were heavier and had a higher prevalence of abdominal obesity and hypertension than the other groups. Such findings call for further clinical and nutritional examinations of the immigrants. Appropriate care strategies and preventive measures need to be adequately developed to offer the perspective of improved health for the immigrant population.

The results of an Italian study suggested that immigrants living in Bologna interact positively with their new environment (Toselli S et al. Health & Stress 2008;24 327–34). The overall situation of the immigrants was characterized by a low level of stress and discomfort and a medium level of well-being. Tunisians were the most stressed, with the highest level of discomfort and the lowest perceived quality of life. Tunisians are a group that has been living in Italy for a long time. The Roma and Kosovars, in spite of their higher unemployment, perceived a better quality of life and this perception was associated with the desire to remain in Italy. Almost all the Senegalese wished to return home, while the Tunisians and Moroccans were equally divided among those who wanted to stay in Italy and those who wished to return home.

Obesity is a recognised challenge and it is among the fastest growing health problems worldwide. Stress and rapid changes in lifestyle have often been associated with an increased incidence of obesity in immigrant populations. Increases in body mass index (BMI) and/or intra-abdominal adipose tissue are highly correlated with risks of cardiovascular diseases and many other chronic diseases. The alarming increase in the prevalence of obesity was documented in the studies by Toselli et al. with a focus on North Africans and immigrant from this area (35). The overall results revealed a higher prevalence of overweight and obesity in females than in males in natives in North Africa and this pattern was also shown among immigrants. Literature reports have covered many populations and some have shown that almost half of some adult North African native and immigrant populations may be overweight or obese. Physical inactivity is higher than 20% in males and 40% in females in North African. The results underlie a higher health risk in North African immigrants than in residents. Toselli et al. conclude that specific public health strategies should be adopted in immigrant populations of North African origin to control the obesity epidemic (35).

The theme of overweight with focus on children was covered in the review by Gualdi-Russo et al. and Toselli et al. (7, 37). They report that childhood overweight and obesity have increased at an alarming rate with the most vulnerable group being children with a migrant background. The accumulated data confirm that children and particularly girls of North African origin are more often overweight and obese compared to the native children. The trend is similar in urban areas of North African countries. Contributing factors include Westernization of eating habits and the lack of physical activity. Body image perception and beauty ideals among North African societies equate overweight and obesity with good health, higher social status, fertility and prosperity. Gualdi-Russo et al. point out the
complex contributing mechanisms of acculturation in the host society and traditions of the country of origin which influence the issues of childhood overweight and obesity (4-7, 37). There is a societal need to target health promotion at risk groups advocating healthy diet and regular physical activity. The present review considered children but Toselli and Gualdi-Russo have shown that the same patterns apply to adult immigrants and they have recommended that social support may be an important means of stimulating physical activity, particularly in women (35).

The significance of physical activity for health goes beyond BMI. Epidemiological studies by the EUNAM partners from Sweden have shown that physical activity serves to protect against poor health, despite increased BMI and smoking (Faskunger J, ... Sundquist K, Sundquist J. BMC Public Health 2009;9: 304). Immigrant women and men born in Arabic-speaking countries possessed an over-risk for coronary heart disease compared with Swedish-born individuals, even when the level of education and the employment status were taken into account (Koochek A, ... Sundquist J. Eur J Cardiovasc Prev Rehabil 2008;15: 78-82). For elderly people who were occasionally physically active, the risk of all-cause mortality was 28% lower than for those who were physically inactive. Women and men who were physically active at least twice a week had a 41% lower risk of developing coronary heart disease than those who performed no physical activity after adjustment for all explanatory variables. The risk of reporting low levels of physical activity was significantly higher for women born in Southern and Eastern Europe and "all other countries", compared with women born in Sweden. The public health value pinpointing correlates of physical activity in different population groups is to influence their physical activity patterns and to target behavioural change programs (7).

Mental and psychosomatic well-being of immigrant populations promotes their successful participation in the new society (5, 36). According to previous studies, factors negatively influencing mental health of immigrants were occupational and economic instability, cultural and social marginalization, family estrangement, pressure to send money to the family, racial discrimination, and lack of statutory documentation. In the present issue Toselli et al. covered psychosocial health issues among immigrants. They found that immigrants of different ethnic groups show heterogeneity in the risk of psychosocial disorders, but they are generally at a higher risk than the local population. The risk is higher in women and in those with a poor socioeconomic status. Acculturation and discrimination worsens psychosocial health. There is a need to collect detailed data on the psychosocial health among the various immigrant groups in Europe which could then be the basis of improvements.

The health of the children of immigrants is an important index of equality and well-being. Growth and development in infancy and early childhood are key indicators of an infant's health and long-term well-being. However, in a multi-ethnic society, evaluation of the growth of a child must take into account their ethnic origin. Since children of different ethnic groups may grow at varying rates, it is important to have appropriate group-specific information about growth and development. Moreover, ethnicity is an index of many factors, including environmental influences (such as nutrition) and cultural practices that can affect the outcome of birth and growth. The well-being and health of immigrant children is part of a broad issue of second generation immigrants and their assimilation into the society. The themes of child health, growth and psychosocial adaptation were reviewed by Gualdi-Russo et al. (5). Age at menarche was lower in immigrant girls, while male pubertal progression seemed faster in immigrants than in European natives. Negative effects on growth, health and psychosocial adaptation were noted among immigrant children living in low-income and disadvantaged communities. A higher morbidity associated with the minority status and low socio-economic situation. The authors call for adequate healthcare for disadvantaged immigrant groups.

Indicators relating to child bearing may be related to factors including social and physical well-being. Li et al. examined association between country of parental birth and small-for-gestational-age (defined as a birthweight of more than two standard deviations below the mean) in first singletons births (22). The rate was higher in newborns with non-Swedish born than in those with Swedish born mothers (4.1 and 3.3%, respectively). Immigrants from Southern European countries, Africa, and Asia had higher risks of small-for-gestational-age in than those in the reference group, and the risks were even higher in compatriot parents. The results showed that the country of birth affected the risk of small-for-gestational-age. Maternity care should pay a special attention to pregnancies in certain population groups. The same authors studied preterm births among immigrants (20). Increased risk of particularly for very preterm birth was observed for mothers from Eastern Europe, Central Europe, Africa, and Asia. The increased risk disappeared in the second-generation female immigrants. Country of birth in mothers affected the risk of preterm birth; maternity care should pay special attention to women from certain population groups.

Disease panorama in immigrants compared to natives: guide to prevention and etiology (WP2)
Many studies have shown a relative decline in the health status of the immigrants compared to the native population. For example, the morbidity and mortality from coronary heart disease is higher among immigrants than in the majority population even when the results were adjusted for level of education and employment status. However, it has not been possible to draw definite conclusions as to whether these high-risk levels originated from the country of birth or whether they were the result of migration or the acculturation process, which has been a weakness in many epidemiological studies on migration.

Infectious diseases are an example on how immigration may dramatically change the disease panorama in receiving countries as reviewed by Khyatti et al. (18). Overall infectious disease mortality has significantly decreased in most European countries. Tuberculosis has re-emerged in Europe and it is concentrated among migrants, specifically among those infected by drug-resistant strains. Migrants arriving from North Africa and sub-Saharan Africa carry higher rates of hepatitis C virus (HCV) and hepatitis B virus (HBV) than the host European populations. The prevalence of human immunodeficiency virus (HIV) infections in North African populations is very low, generally around 0.1% and thus the impact of North African migrants in European HIV infections is low. The hallmark of the HIV epidemic in Europe is the increase in the penetration of non-B strains and the circulation of several recombinant forms resistant to treatment. An important source of these is the migration from sub-Saharan Africa, and persons from that region are using North Africa as a transit point into Europe. Leishmaniasis is a re-emerging zoonotic disease in Southern Europe although not specific to migrant groups. Similarly to HIV, migrants from sub-Saharan Africa may be infected with malaria and represent a risk of malaria re-emergence in Europe. Khyatti et al. conclude that high migrant influx into Europe has resulted in changing patterns of communicable diseases which require a continuous surveillance. According to WHO guidelines, targeted screening followed by preventative vaccination can serve as an initial step. Integration of migrants into the local healthcare systems is a subsequent step allowing for long-term treatment and follow-up. Public health campaigns emphasizing prevention are considered essential for the mitigation of disease dissemination in the migrant pool and for second-generation migrants.

Immigration is influencing the pattern of recessive diseases in Europe, as reviewed by Anwar et al. (1). Consanguinity is common in North Africa, reaching half of all marriages in some areas. As a consequence, recessive disorders are common in the region, sickle cell disease leading in prevalence, followed by thalassaemia. With immigration they have spread to Europe and are likely to be further propagated because the habit of inbreeding is continuing in many immigrant communities. Sickle cell disease and thalassaemia are well known to the European medical community but rarer recessive diseases endemic outside Europe are less familiar. An example is familial Mediterranean fever, which is common in the Eastern Mediterranean area and is emerging as the most common hereditary autoinflammatory disease in countries with immigrants from the Eastern Mediterranean area, including Turkey. Anwar et al demonstrate that historic movement of populations and current immigration are influencing the concept of ‘endemic’ disease. Diseases migrate with people and the European medical community needs not only to recognize the challenges of infectious disease but also to be able to diagnose, treat, and help prevent emerging diseases.

Immigrant studies have had and will have an important contribution to the etiological understanding of disease causation in defining the causes as ‘environmental’ or ‘inherited’ (equal to genetic) (Hemminki K,...Försti A. Nature Reviews Genetics 2006;7: 958-65). These concepts and the numerous Swedish immigrant studies on cancer (10-15, 26-33) were reviewed Hemminki et al. (12). A disease appears to be environmentally caused if the risk changes much upon immigration and if it changes between immigrants and their offspring. A stable disease risk may indicate a strong genetic contribution. The classical cancer studies on Japanese immigrants to USA and multinational immigrants to Australia showed that the incidence in common cancers changed to the level of the new host country in one or two generations. These findings were fundamental to the understanding of the environmental etiology of human cancer. Studies in Sweden have shown that the second generation immigrants, those born in Sweden, already have adopted the Swedish cancer incidence (Hemminki K, ...Mousavi SM, Sundquist J. Int J Cancer 2010;126: 2259-67). Many immigrants had arrived as young couples to Sweden, whereby their Sweden-born children have a completely indigenous genotype of their parents. Such data led the authors to conclude that the childhood environment, rather than genotype, is very important in setting the individual’s cancer destiny.

In the review by Hemminki et al. some extreme differences in cancer incidence among immigrants were highlighted, including high risks of liver cancer in East Asians and Africans, nasopharyngeal cancer in Southeast Asians and North Africans and mesothelioma among Turks (12). Also the known high risks in developing countries for liver, esophageal, stomach and cervical cancers were observed among immigrants. The causes for these high-risk cancers are ascribed to microbial infections, nutritional imbalances and toxins. Cervical cancer was not increased among immigrants from developing countries; in fact the risks were very low probably due to the sexual habits of the immigrant groups. North African immigrants had an overall cancer risk 20% lower than Swedes. The risks of prostate, testis, skin cancers, and of melanoma are very low but, in contrast, the risks of liver, pancreatic, oral and male lung cancers were higher compared to Swedes. Male pancreatic cancer in North African immigrants was more common than in any immigrant group for
Cancer diagnostics have been relatively uniform over the past 50 years (12). Thanks to the International Agency of Cancer (IARC) in Lyon, quality-guaranteed cancer rates are available from various parts of the world and these are presented in the books 'Cancer Incidence in Five Continents'. Yet, as discussed by Hemminki et al. cancer incidence data are lacking for most countries of the world and examples are shown for Egypt and Morocco on how the introduction of local cancer registries may proceed. IARC has complemented its efforts on global estimates on cancer incidence and mortality by the GLOBOCAN database (globocan.iarc.fr). The database provides contemporary estimates on major types of cancer at a national level for 184 countries of the world. It should be emphasised that GLOBOCAN data are based on estimates and the users are asked to note that “The sources of data are continuously improving in quality and extent, estimates may not be truly comparable overtime and care should be taken when comparing these estimates with those published earlier. The observed differences may be the result of a change in the methodology and should not be interpreted as a time trend effect”. Hemminki et al. discuss the use of immigrant data to extrapolate to the incidence in the country of origin (12). A successful example was the noted high risk of testicular cancer in Chilean men in Sweden which was later confirmed when Chilean cancer registry data became available.

Even if we currently have reasonable estimates on the global cancer incidence, international standards in diagnostics are less developed for many other diseases. Diagnostic criteria may not be uniform within a single country and even for developed countries population-based incidence figures may not be available. Thus, international incidence data are not reliably known for a large variety of diseases and it is difficult to conclude anything about environmental and genetic causation (8). In some countries, such as Sweden, all hospitalizations are available since 1987 in the Hospital Discharge Registry. Thus diseases requiring hospitalization can be obtained from this source (3). The additional advantage for Sweden is that the birth country of every individual is known.

The Swedish EUNAM partners have used the Hospital Discharge data in immigrant studies, for example, to examine whether there is an association between country of birth in first-generation immigrants and hospitalization for rheumatic diseases, and to further study whether any such associations remain in second-generation immigrants (Li X, Sundquist J, Sundquist K. Arthritis Rheum 2009;60: 1588-96). First-generation immigrants from Iraq had a higher risk of rheumatoid arthritis than native Swedes who were the reference group. The risk of systemic lupus erythematosus was increased in immigrants from Iraq and Africa; these raised risks persisted in the second generation. These findings suggested that both genetic and environmental factors are involved in the aetiology of specific rheumatic diseases. Using the same source of data the Swedish team analysed whether there is an association between country of birth in first-generation or second-generation immigrants and hospitalization for an inflammatory bowel disease (Li X, Sundquist J, Hemminki K, Sundquist K. Inflamm Bowel Dis 2011;17: 1784-91). The incidence was decreased in the first-generation immigrants and the pattern partly remained in the second generation. However, some groups of second-generation immigrants had higher risks of Crohn disease and some others of ulcerative colitis. The data may imply poor adaptation of the gastrointestinal immune system in the offspring of immigrants.

The Swedish partners carried out a nationwide study on the association between immigrants' country of birth and hospitalization for type 2 diabetes (T2D), and, further, whether any such association remained in second-generation immigrants (21). First-generation African men and women showed a relative risk about 3.0 followed by Lebanese men and women. Asian and Chilean women tended to have increase risks. However, the risks appeared to disappear in the second-generation, prompting the authors to conclude that the risk factors were mainly environmental.

Gulliver et al. reviewed Swedish studies on mental disorders and suicide risk among immigrants (3). The summarised studies showed increased risks of common mental disorders, such as depression and psychotic disorders, in immigrants to Sweden compared to native Swedes. Moreover, the results showed notable differences between different immigrant groups and between males and females. Risk of suicide was increased in some immigrant groups, but decreased in others. The authors concluded that targeted qualitative and intervention studies could facilitate efforts to develop and implement preventive methods for immigrants at high risk for mental ill health. Li has shown results on autism related to neighbourhood effects, including immigrant dense areas in Sweden (19).

Health care utilization by immigrants compared to natives (WP3)

The EUNAM reviews demonstrate that migrants are more susceptible to problems associated with somatic, emotional and mental health arising from their vulnerability and cultural obstacles in the host country. Yet equality of need for health care among immigrants and natives does not necessarily translate into equality of use, as there may be various invisible barriers to health care. Differences in use of healthcare may result from lack of access or language barriers. For example, if immigrants do not use the medical system in the
same way as the native population, they may not know of their diseases in the first place. In addition, if immigrants are less likely to be treated for some conditions, they could die more quickly and, paradoxically, have a lower prevalence of these conditions than the surviving population. It is also possible that data quality may differ between immigrants and the native population. The foreign-born are also less likely to have adequate health care and insurance coverage, and may not be familiar with the many phases of the health care system.

EUNAM partner Dourgnon at IRDES, Paris, has conducted French population health surveys on representative population samples showing that immigrants have a lower rate of access to private practice ambulatory care of both general practitioners and specialists compared to the rest of the French population. These differences pertain to immigrants’ relative disadvantaged social conditions, including education, income and access to complementary insurance. Most of the observed differences disappeared once the socioeconomic characteristics were adjusted in the analysis. The survey showed a more contrasted situation in terms of preventive care; immigrants more often declared being vaccinated but more seldom used screening tests.

A relevant and timely addition to the EUNAMt summary is the ‘Grenada Declaration’, originating from the 2014 meeting of the European Public Health Association (http://www.eupha-migranthealthconference.com/?page_id=1766). It has implications to many aspects of immigrant health but particularly to health care utilization on which the implemented economic austerity policies in many European countries may limit the access of immigrants and lead to further inequality.

Population well being and health care in North Africa with time trends (WP4)

The health care infrastructure has suffered for decades due to medical brain drain, i.e. emigration of health professionals, including physicians and nurses. Most affected have been low and medium income countries, particularly from Sub-Saharan area but also from North Africa. The emigration has weakened directly medical services and indirectly the quality of medical training. Moullan investigated the impact of foreign health assistance and observed a significant negative effect of foreign assistance on the medical brain drain (24). Thus, emigration rates of doctor increased in proportion to the amount of health aid received by recipient countries. However, health aid played a key role in the improvement of vaccination, treatment and prevention which may reduce death rate. These positive effects may eventually decrease physicians’ emigration rates and weaken the vicious circle of physicians drain.

In most developing countries, urbanization is a major factor involved in the high prevalence of obesity. Although Africa is the least urbanized continent, its population is becoming increasingly urban and its cities are growing at unprecedented rates. Despite widespread poverty in North African cities, there is easier access to cheap foods with high fat and sugar contents among the urban poor than among the rural population. A more industrial diet has been replacing their traditional diet. Although total energy intake is higher in rural areas, it has a lower contribution from fats and animal products. Calorie expenditure is also higher in rural people due to agricultural work and lower use of transportation systems; by contrast, urban people ride motorcycles, cars or buses. Therefore, urbanization, aging and the socioeconomic level have been considered the main determinants of low physical activity levels in North African populations. Accelerated urbanization and altered dietary and lifestyle patterns have caused a progressive increase in cardiovascular risk factors such as obesity, hypertension, diabetes and hypercholesterolemia.

Contrary to what occurs in developed countries where low socioeconomic status (SES) and poor neighbourhoods are associated with a higher prevalence of obesity and chronic diseases, an inverse or low SES-high adiposity association has been reported in Africa. Female fatness is a cultural symbol of beauty, fertility and prosperity. Women with low educational levels do not recognize the risks and health consequences associated with overweight and obesity, since fatness is considered desirable and perceived as related to higher social status.

Nevertheless, very few studies have examined these associations over time, making it difficult to assess the socioeconomic differences in the rate of progression to overweight and obesity in urban Africa.

The EUNAM review by Toselli and co-workers could conclude about the prevalence of overweight/obesity in North African adults that there is a consistent difference between men and women, women showing higher frequencies of overweight and obesity than men (37). The literature data show that the highest prevalence of obesity is reached in Egyptian females. This could be related to cultural values, since North African populations favor larger body size among women as a sign of fertility, healthiness or prosperity. Among males, Egyptians again show the highest values of overweight and obesity. Despite the limited literature data available, an increasing trend over time in the prevalence of obesity was observed in North African countries, especially in Egypt. Obesity is higher in females than in males and in urban people than in rural ones, in agreement with populations in other parts of Africa. Accelerated urbanization and changes in dietary and lifestyle patterns (especially physical inactivity) have contributed to the increased prevalence of obesity,
hypertension, diabetes and hypercholesterolemia, and thus the risk of cardiovascular diseases in North African populations. It has been reported that diets in low- and medium-income countries are converging on what is often termed the “Western diet”, characterized by a high intake of refined carbohydrates, added sugars, fat and foods of animal origin.

In North African populations, the reduced work-related energy expenditure in the more labor-intensive occupations, changes in transportation, leisure and domestic production have led to reduced physical activity (37). The transition from agricultural labor (production and subsistence) to salaried labor that occurred toward the end of the 20th century in many developing countries decreased the physical activity of women more than men. Throughout both North and Sub-Saharan Africa, obesity and physical inactivity in both sexes is associated with high social status, fertility, good health and prosperity. Furthermore, gender differences in cultural (regional) habits can intensify the gender differences in obesity.

In the last twenty years, an increase in overweight and obesity in children and adolescents has been observed in both developed and developing countries. In developed countries, children of immigrants seem to be particularly at risk. For EUNAM, Gualdi-Russo and co-workers surveyed the literature regarding North Africans living in North African countries and as immigrants in Europe has highlighted an increasing prevalence of overweight and obesity in children and adolescents of both groups (7, 37). In several European countries the prevalence of overweight and obesity is higher among children of Moroccan and Middle Eastern/North African immigrants than the native children of both sexes. The prevalence of overweight and obesity seems to be higher in North African female children and adolescents than in males both in Europe and in North African countries, suggesting that girls are particularly at risk.

Socio-cultural factors, in particular, should be viewed as the origin of the observed trends in increasing childhood overweight and obesity in immigrants of North African origin and in children living in North African urban areas (7). First of all, the westemization of eating habits leads to higher energy intake and a predisposition to weight gain. Body image perception and beauty ideals among NA societies can exacerbate the problem, as overweight and obesity are not perceived as a threat to health but are considered desirable and are associated with good health, higher social status, fertility and prosperity. Another major predisposing factor is the lack of a health-conscious exercise culture among North African societies. Children and adolescents are unaware of the benefits of physical activity and its role in preventing obesity. The lack of exercise is particularly diffuse among girls of NA descent. This fact, besides revealing an important aspect of the status of women within the society and their place in the public space, is likely at the origin of the higher prevalence of overweight and obesity found in girls living in North African countries and as immigrants in Europe. It seems, therefore, that childhood overweight and obesity among NA immigrants in Europe are conditioned by factors linked to acculturation in the host society (the acquisition of Western eating habits) and other aspects maintained from the country of origin (e.g. body image perception, low PA, women’s status and their place in society).

Psychosocial wellbeing may not be objectively compared between societies (5, 36). When assessing psychosocial difficulties among immigrants living in Europe, one needs to consider the difficulties faced by populations living in North African countries. People who live in countries where there is a lack of access to mental health services are less likely to be diagnosed and poor access to services could affect the rate at which depression is diagnosed. This could explain the low recorded rate of depression in countries with political conflicts and instabilities, such as Tunisia, Libya and Egypt, as well as the stigma acquired due to mental or psychological disorders. It has been found that people suffering depression numbered more than 5 % in the Middle East, North Africa, and sub-Saharan Africa. The prevalence of depression in women was double that in men.

In order of medical research to properly serve the North African population research ethics need to be in place. Conducted research must comply with laws and other requirements for research that involves human subjects. The overview by Marzouk et al revealed that noticeable efforts have been made to regulate research ethics in certain countries in the Middle East (23). They have complied with the majority of protections mentioned in the international guidelines related to research ethics. Accordingly, the composition and functionality of the internationally registered research ethics committees comply to the international guidelines. There is growing awareness of research ethics, extending to teaching efforts to undergraduate and postgraduate medical students.

Disease spectrum in North Africa now and then (WP5)

Communicable diseases such as human immunodeficiency virus (HIV), malaria, tuberculosis (TB) and hepatitis viruses, pose a worldwide public health problem in both developing and developed nations resulting in significant mortality (18). The North African region is no exception to this rule, with half of reported deaths being directly attributable to communicable diseases. The history, presence and future of infectious disease in North Africa has been reviewed for EUNAM by Khyatti and co-workers (18). Vaccination programs seek to reduce prevalence levels, yet many North African countries exhibit intermediate or high prevalences for many
bacterial, zoonotic, viral, and parasitic diseases. Due to pathogen adaptability, the NA region is now faced with the persistence or stagnation or even the resurgence of certain diseases, in particular, TB, hepatitis, HIV, meningitis and leishmaniasis. Migration via North Africa to other destinations adds another level of complexity in disease spread and impacts the health of the local population. Adequate monitoring and preventative strategies must be in place so as to mitigate the negative impact on NA residents’ health and reduce the burden on future generations.

Understanding and combating the spread of disease is among the most serious challenges we face today. Due in part to the adaptability of pathogens, re-emerging diseases such as TB and previously unrecognized diseases, such as hepatitis C and HIV, have emerged as new threats. There is also a situation for leishmaniasis endemic for visceral and major outbreaks for cutaneous forms in the region. Leishmaniasis is expected to increase due to global and ruralization of suburban space and the zoonotic cutaneous leishmaniasis would pose more problems in the future unless significant control measures are taken. The role of migration movements in NA countries is of increasing importance, regarding their influence on the infectious diseases map both in the region and in the world. Suitable strategies are needed to address the health needs of immigrants and to protect the health of native populations, in order to preserve the progress resulting from decades of fighting against infectious diseases.

There have been cancer registries in Algeria and Tunisia the data from which have been included Cancer Incidence in Five Continents. New registries have been established in Egypt and Morocco and the incidence of cancer in the North African region can be assessed based on these data. According to the Casablanca Registry in Morocco, the 5 most common cancers in women were breast (ASR 35.0/100,000) cervix (15.0) thyroid (6.7) colorectum (5.8) and ovary (5.3). Cervical cancer is relatively common in Morocco. Mutation analysis of the related human papilloma virus (HPV) mutations suggested a predominance of European lineage strains among Moroccan HPV 16 isolates; this raises the possibility that HPV16 variants have a preferential role in progression to malignancy and could be associated with the more aggressive nature of cervical cancer (34). In Moroccan men the ranking was lung (25.5) prostate (9.6) bladder (8.7) colorectum (8.1) and non-Hodgkin lymphoma (7.2). There are some special features of cancer incidence in North Africa. Nasopharyngeal cancer is endemic in Western North Africa with one of the highest rates in the world but largely limited to Morocco, Tunisia and Algeria. It showed a 3-fold male excess. The age-specific incidence displays a little peak in the teens followed by a steady increase to reach a maximum at age of 65-69 for men and age 70-74 for women. The high incidence is believed to result from the interactions of genetic, viral infection (Epstein Barr virus) and environmental factors, including diet at a young age. There is a strong but opposite North African east-west gradient of decreasing incidence for bladder and liver cancers which are common in Egypt and rarer in Algeria and Morocco. Causes for the high incidence are Schistosoma hematobium and hepatitis B and C infections, respectively.

Consanguinity is common in North Africa (NA) and the estimates range from 40% to 49% of all marriages in Tunisia and 29% to 33% in Morocco (1). As a consequence, recessive disorders are common in the NA region and we give some examples. Thalassaemia and sickle cell disease/anaemia constitute the most common inherited recessive disorders globally and they are common in NA but with immigration they have spread to Europe and to other parts of the world. Another example is familial Mediterranean fever, which is common in the Eastern Mediterranean area. The reason why consanguinity is related to recessive disease is the fact that consanguinity imply sharing of genetic heritage because of marriage between close relatives originating from a common ancestor. With limited natural selection, recessive genes may become more frequent in an inbred compared to an outbred population.

North African and Middle Eastern populations share disease alleles that cause recessive diseases as reviewed for EUNAM by Anwar and co-workers (1). For example, the Tunisian population shares founder mutations with other North African and Middle Eastern populations for 43 inherited conditions. Founder chromosomal segments described in Tunisian patients with Meckel syndrome (characterized by renal cystic dysplasia), sickle cell anaemia and Xeroderma pigmentosum (XP) group A are identical to those described in Algerian patients. The founder mutations leading to adenomatous polyposis of the colon and the hepatocerebral mitochondrial DNA depletion syndrome are reported on the same haplotypes between Tunisian and Moroccan patients. In Tunisian, Algerian and Moroccan patients share haplotypes for autosomal recessive non-syndromic optic atrophy, Rare lymphocyte syndrome and for the major founder mutation p.R228X in XPA: beta-thalassaemia and familial Mediterranean fever were discussed earlier.

Lessons for prevention in North Africa, EU and the world (WP6)

Despite the alarming effects of obesity on health, economy and society, national strategies to combat obesity do not exist in North African countries. Thus far, obesity has not been recognized as a major public health priority, and convincing policy makers about the need to prioritize action to prevent obesity will be a crucial first step.
In general, all immigrant groups participate in sporting activities less frequently than the native population. This can be ascribed partly to cultural differences in sports participation among ethnic groups and between men and women, as women participate in sports less frequently than men. Since overweight and obesity reflect an energy imbalance, the main areas of intervention are dietary intake and energy expenditure, for which the main modifiable component is physical activity.

As overweight and obesity in childhood are associated with serious health risks, it is important to target the most at risk groups (i.e. daughters of immigrants) with health promotion messages and lifestyle intervention strategies aimed at preventing overweight, e.g. promotion of a healthy diet, information on the health risks linked to overweight and obesity and on the role of physical activity in weight control.

The Swedish data on the country of parental birth and pregnancy outcome indicators of small-for-gestational-age and prematurity suggested increased risks particularly for mothers born in Africa and in Asia. The authors recommended that maternity care should pay a special attention to pregnancies in certain underserved population groups including immigrants from defined areas.

Changing patterns in communicable disease transmission and emergence in Europe require a constant surveillance but remains non-harmonized between EU member states. Communicable disease among migrants is an issue that must be tackled on multiple fronts by the EU governments, public health agencies, and health institutions. The WHO describes four Axes in the Global Action Framework (2010) which delineate a comprehensive outline for public health authorities, including increasing awareness, creation of evidence-based public health policies, vaccination prevention strategies, and screening. Targeted screening for migrants arriving from highly endemic countries can serve as a front-line defense that identifies the groups most at risk for increasing national prevalence levels, while also being cost-effective in nature. This can be followed by preventative vaccination programs, which seek to concentrate resources on those who need it most. A successful integration of migrants into the local health care system ensures that disease cases are diagnosed and treated, which helps to define the proportion of national incidence cases that are directly attributable to migrants. Next, the creation of partnerships between public health agencies and local health facilities in order to ensure the management and follow-up of migrant cases once they have integrated the health care system, an essential aspect for communicable diseases with long latency periods. Finally, the diffusion of national educational campaigns as a form of transmission prevention, which target migrants and second-generation children of migrants at risk of contracting a disease when traveling back to their home country.

The incidence rates for most cancers are low in developing countries, but for a few cancers the rates are very high. These include liver, nasopharyngeal, esophageal, stomach and cervical cancers. The causes for these cancers are usually known and they are related to microbial infections, nutritional imbalances and toxins, and the risks of these cancers tend to be high in first generation immigrants in EU. Cancer rates are high in EU for most cancers in agreement with most developed countries. The reason for the high risk is referred to as ‘western lifestyle’ and ‘affluence’ but more precisely the reason is probably excess energy intake. Overweight and obesity are risk factors for many cancers, as discussed elsewhere in this special issue. An important conclusion from the reviewed (Swedish) immigrant studies in which a large proportion of the present immigrant population had entered Sweden in their early 20s is that the cancer pattern or destiny is set before age 20 years. Those who lived in a low-risk country until adulthood remain at low risk and, vice versa, youth in a high-risk country destines a high risk for the rest of one's life. This is highly relevant for cancer prevention which should target early years of life. In the same vein, the growing problem of obesity and excess energy intake in the developing countries will predict increasing cancer rates in some segments of the population which had traditionally low rates of cancer.

The Swedish on hospitalization for type 2 diabetes demonstrated increased rates in first-generation African men and particularly women born in Asian and Chile. However, as the risks appeared to disappear in the second-generation, he authors to conclude that the assumed risk factors include obesity, dietary fat intake, smoking, and low levels of physical activity, of which obesity and lack of physical activity have been a repeated theme in EUNAM survey. An important message is that these are modifiable risk factors but preventive measures need a special targeting at vulnerable immigrant groups.

EUNAM has discussed consanguinity in North Africa, and some of its deleterious consequences in indigenous and immigrant populations. The distribution of founder mutations is the result of historical migratory movements and many common disease alleles in the current NA have origins elsewhere but the disease burden in NA is largely the result of inbreeding. NA has been a main source of European immigrants and the disease alleles have been introduced to the national gene pools. However, for recessive diseases the most frequent disease manifestations are in inbred immigrant populations. It remains unclear how well European health care providers are able to cope with the imported diseases. The example of periodic fever syndromes showed that a new disease may be introduced
into immigrant-dense countries with little notice by the medical community. Diagnostics of recessive disease require demonstration of specific mutations in target gene. Thus knowledge of the common founder mutations in ethnic immigrant populations is required and diagnostic tests used in NA could be applied.

Conclusions

The EUNAM project was possible because EU granted special funds for immigration studies which were specifically earmarked for health studies on North African immigrants. The North African and the Eastern Mediterranean areas have historically been the main sources of immigrants to EU but internal migration in EU has probably exceeded the movement from outside more recently. For example, close to 70% of the migrants to Germany in 2013, totalling 1.2 million, came from other EU countries. Even if the EU legislation guarantees some basic rights to those moving within the EU, many migrants still face the same problems that the non-EU migrants experienced earlier and one would need to learn from this experience. As the massive internal movements are very recent the social consequences are not yet known. In any population, migrants are always a minority and national funding for immigrant questions is very limited. EU should therefore open dedicated funding opportunities on migrant health-related themes.

The survey conducted by EUNAM show that studies in immigrants have advanced our understanding of disease aetiology and epidemiology in many ways (10). In the course of these scientific considerations, it has become increasingly clear that immigrant health issues are no different from those of natives as these are germane to human health.

REFERENCES

Potential Impact:
EUNAM project has had impact through dissemination activities constituting I) scientific publications, II) meetings and training, and III) training fellowship program. Each of these topics is presented below.

The meetings cited in LIST OF DISSEMINATION ACTIVITIES included totally 1151 participants. EUNAM biannual meeting had combined some 160 attendees. Although the same EUNAM partners attended many of these meetings it would be safe to estimate that close to 1000 persons have taken part in some of these EUNAM activities. Some meetings were attended by representatives of governments, international agencies and media.

I. SCIENTIFIC PUBLICATIONS
 Altogether some 50 scientific publications have been produced (44 are included in the publication list of the Final Report) and some are still to be finalized. A special issue of The European Journal of Public Health (EJPH, see below) and Annali of the University of Ferrara were edited by the EUNAM team. The publications were all in international journals or annals of various specialties and many of high reputation. Many of them can be accessed and printed from PubMed. EJPH is a multidisciplinary journal in the field of public health, publishing contributions from social medicine, epidemiology, health services research, management, ethics and law, health economics, social sciences and environmental health. The journal provides a forum for discussion and debate of current international public health issues with a focus on the European region. In 2013, the impact factor of the journal was 2.5 ranking among the 20 top journals in public health. The journal is published on behalf of the European Public Health Association and the members have direct access to the electronic version of the EJPH by logging on to the EUPHA database.

II. MEETING AND TRAINING ACTIVITIES

These included 2 components: A. biannual project meetings, and B. ad hoc meeting/training events. Meetings and training were an unseparated part of EUNAM activity because even the biannual project meetings included younger participants from the partner institutions.

A. PROJECT MEETINGS

2011-2015 Biannual Project Meetings

Altogether EUNAM met jointly 8 times in various (usually partner) locations. Detailed information on these can be found on EUNAM web site (http://www.dkfz.de/en/molgen_epidemiology/EUNAM/EUNAM.html). The total number of attendees in these meeting was about 160. In addition to partners, a large number of younger associates attended the meetings and these thus provided excellent training opportunities for active participation in the form of scientific presentations and participation in discussions.

B. EUNAM AD HOC MEETING/TRAINING EVENTS

The LIST OF DISSEMINATION ACTIVITIES gives most of the meetings that EUNAM organized but does not include local activities by the partners. Some main events are detailed below.

➤ Organisation of work place training and workshop on “history of immigration”, on June 24-25, 2011 at Pasteur Institute of Morocco, with a first objective to inform researchers and students on the objectives of the EUNAM project and to define the methodology to be used to achieve the objectives of the project. The workshop was also aimed to:
  • Have a picture of the situation of immigrants in Morocco, their status, their way of travel and life in different cities in Morocco.
  • Collect data on the diseases from which the immigrants suffered and where did they get them in an attempt to understand how this important old phenomenon (i.e. immigration) had some impacts on the health system.

Since researchers in our institute are specialized in research on infectious diseases this workshop was useful to bring together researchers from our team working on biology and health aspects with national experts working on migration. The workshop was attended by Ph.D students (16) as well as student’s preparing their Master degree (20) at Pasteur Institute and was a good opportunity to inform and motivate them on the importance of health studies related to immigrants.

➤ Organisation of a workshop on “circulation of infectious agents and migratory flux of sub-Saharan populations: exemples of tuberculosis and HIV”, on December 7th, 2011, at Hotel Anfa in Casablanca. During this workshop, participants working on immigration and health were invited to this meeting. These scientists had diverse backgrounds. The aim of the workshop was to share data on Tuberculosis, HIV and subsaharian immigration. This meeting was organised to collect and understand the phenomenon of immigration and its implication to the overall picture of health in a Mediterranean country such as Morocco with a focus on TB and HIV as infectious diseases. This workshop further allowed us to evaluate the impact of subsaharian immigration on the HIV-1 molecular epidemiology in North Africa on the diversity and development of resistance mutation. One of the most significant impacts of immigration on the HIV epidemic is the implication in the molecular epidemiology of the virus. Given the central role of HIV diversity in
the HIV pandemic it is imperative that global molecular epidemiology surveillance is continued and improved for early detection of new variants spreading in the population before they become more prevalent. It is therefore essential to identify resistance profiles circulating among the various infected populations concerned, with a focus on migrants. The workshop was attended by Ph.D students (8) as well as student's preparing their Master degree (12) and this was a good opportunity to delineate and show that these infectious diseases among migrants is an important issue that must be tackled.

14.5.2012 WORKSHOP ON "BODY IMAGE PERCEPTION AND MIGRATION"

Conducted by:
University of Ferrara, Italy (EUNAM Project),
IUSS, Ferrara 1391 (University Institute for Higher Studies)

Place:
Dep. of Biology and Evolution
Corso Ercole I D’Este 32, Ferrara
May 14, 2012.

Speakers
C.G.M. Weatherford (University of Texas, USA)
V.S. Manzon (University of Ferrara, Italy)

Participants:
Students of degree courses, PhD students, university professors.

Organizers:
Emanuela Gualdi (University of Ferrara)
Stefania Toselli (University of Bologna).

Organisation of a workshop on "Epidemiology and aetiology of viral hepatitis (A,B,C,D,E)", from September 18-19, 2013 at Pasteur Institute of Morocco, Casablanca. The objectives of this workshop were to have a clear picture on the epidemiology and aetiology of viral hepatitis in Morocco and the other North African countries. This workshop was aimed at bringing together groups of experts working on viral hepatitis ranging from basic to clinical virologists, and was focused to collect and discuss very precise data on the epidemiology, etiology and global molecular epidemiology in Morocco and NA migrants to Europe. This workshop was also attended by Ph.D students and Master degree students conducting their research subject in this field. In addition to the possibility for increasing the host country's prevalence for hepatitis, immigrants might also influence the genotypic profiles by infiltrating new subtypes into the local population. There has been in fact a growing concern pertaining to the increasing frequency of some new hepatitis C genotype infections in Western European countries, a genotype that has historically been localized to the Middle East and sub-Saharan Africa, and this genotypic 'infiltration' has been linked to the migrant population and injected drug users. This workshop was useful to bring together researchers from our team working on biology and health aspects with national experts working on migration to discuss these aspects.

18.9.2013 TRAINING AND SEMINARS ON "MIGRATION AND HEALTH"

Conducted by:
University of Ferrara, Italy (EUNAM Project),
IUSS, Ferrara 1391 (University Institute for Higher Studies)

Place:
Dep. Biomedical and Specialty Surgical Sciences
Speakers
Diaa Marzouk (University of Cairo, Egypt)
Vanessa S: Manzon (University of Ferrara)

Participants:
Students of degree courses, PhD students, university professors.

Organizer:
Emanuela Gualdi (University of Ferrara).

11.12.2013 Training and workshop on “Migration and media”

Conducted by:
The Centre for Studies and Research Prospects (CERP) (EUNAM Project),
Arab Institute for Human rights
IOM International Organization for Migration,
Terre d’Asile Tunisie

Place:
Hotel Tunisia Palace
13 Avenue de france, Tunis 1000
11-12 december 2013
Time: 9h-13h

Speakers
Juliette Lenglois
Rola Badran
Amor Nekhili
Piero-Dominique Galloro
Hélène Le Goff
Lina Zekri
Edouard Mills Affif

13.12.2013 Les migrations dans les médias des pays méditerranéens, XXe-XXIe siècles

Conducted by
The Centre for Studies and Research Prospects (CERP) (EUNAM Project), with
Universita Degli Studi Di Ferrera, IUSS - Ferrara 1391

Place:
The Faculty of Humanities and Social Sciences, Tunis
13 December 2013

Coordinators
Hayet Amamou
Riadh Ben Khalifa
Cherifa Lakhoua

Organisation of a Workshop on on Strategy to fight TB and health in immigrants, on March 24-25, 2014 at Hotel Royal Mansour in
Casablanca. One third of the estimated 9 million people who get sick with TB each year miss out. Migrants are especially at risk of missing out on detection and treatment TB because they often suffer from marginalized social status, lack of access to health care and a fear of stigma. In many countries they risk deportation if they are found to have TB. Reaching Migrants is Key to Success in the Global Fight against TB. The risks of TB infection faced by migrants at all points of the migration process – from disease burden at origin; precarious conditions & rights violations during travel; poor living & working conditions, poor knowledge of health systems and barriers to healthcare at destination, and lack of continuity of care throughout the migration cycle. To achieve equitable health care access for migrants we need a better migrant TB monitoring, ensure migrant-sensitive TB health services, implement evidence-based policy frameworks and strengthen multi-sectorial partnerships. By organizing this workshop, our commitment was to find solutions to be able to reach, find, treat and cure TB among migrants, enabling healthy migration. Without targeted TB prevention and control strategies for migrants, several countries of origin, transit and destination for migrants will be unable to achieve or maintain elimination targets. This workshop which was held under the chairmanship of the Minister of Health aims to sensitize policymakers, the media, non-governmental organizations and the public to reach all existing patients in the Moroccan community, to increase outreach efforts/policy changes to reduce stigma related to being a migrant, to sensitize and increase education access and availability about TB risk and transmission for all migrants, to strengthen networking between NGO partners and health services working with migrants to access services, and develop measures to improve communication. The event was attended by a total of 322 participants from the ministry of health, Direction of Epidemiology, experts working on immigrations, SSA-NGO, NGO-working on health, Medias, Scientists, healthworkers, students (25), WHO, representative of ministry of education and prisoners. Different topics were addressed during the workshop:

- Epidemiology of TB and strategy to fight TB
- Health and immigration
- TB and smoking
- Situation of TB and migrants
- Immigration flux

22.10.2014 INTERNATIONAL COURSE ON HEALTH AND IMMIGRATION

Conducted by
Università Degli Studi Di Ferrera
IUSS - Ferrara 1391

Place:
Ferrara (Italy), September 22-24, 2014

Coordinator
Emanuela Gualdi

Speakers
Emanuela Gualdi
Kari Hemminki
Hassene Kassar
Paul Dourgnon
Marco Stefan
Vanessa Manzon
Meriem Khyatti
Carlo Contini
sabrina Masotti
Wagida Anwar
Luigi Grassi
Florance Jusot
Xinjun Li
Stefania Toselli
Natascia Rinaldo

Summary
The main purpose of this course, organized as part of the European project EUNAM "EU and North African Migrants: Health and Health Systems" (leadership: Prof. Kari Hemminki, German Cancer Research Center, Heidelberg, Germany), was to depict the health status and disease, well-being, and use of health services in immigrants. The participants had the opportunity to assess the complexity of the migration dynamics and the health risks associated to changes in lifestyle and in social and cultural environments, learning appropriate care strategies and preventive measures to improve health for immigrants.

26-28.1.2015: POPULATION OF MEDITERRANEAN BOTH SIDES, HEALTH AND SOCIAL ISSUES


1. Context of the meeting

The relevant meeting issues to be covered are inherent in migration movements in the Mediterranean concerning the policies of states, but also individual and collective (regional family, friends, etc.) and strategies and community action. Flows between home and host countries are determined by constraints in the country of emigration and by the policies of the destination country. In this vein, the Maghreb countries represent a space emigration, transit and immigration. The mobility management in this space poses problems related to the rights of alien, especially when they are refugees.

The flaws in the political monitoring of migration are manifested by a weak legal framework that reflects the ambiguity of migration policy and decision makers, leaving some outstanding issues. While it is easy to see the similarities, the Maghreb countries have also each of own history. Geography, historical heritage and the economic, political and social situation in each country are key parameters of the nature of the flows and their pace.

Migration from the Maghreb to Europe has long been regarded as an economic factor regulating the labor market. This immigration temporarily, at first, has become sustainable and authorities of the host country are then found facing multiple problems relating to managing issue of housing, family reunification, integration, racism, health, social policy etc.... The relationship between institutions encourages individuals to develop a reflection on the consequences of their actions in the short and medium term. A presentation of national experiences on migration governance and observation of the role of civil society are needed. This approach calls for scientific interest, since the migration poses problems that are far from being resolved. On the other hand, we have the ambition to make an assessment on the long-term national experiences of migration governance in countries bordering the western Mediterranean, while placing the issue of human rights, especially of health and social issues at the heart of the debate.

2. Aims and scope

This exercise provides information to clarify the migration policies of the Maghreb countries and their relationships with foreign partners (mainly European). The aim is to give more visibility to existing links being woven within the civil society. This approach is presented as an opening of the local reflection on foreign experiences in order to make comparisons and to provide necessary for optimal governance and respectful of the fundamental rights of persons with both theoretical and practical resources.

The study of migration from the Maghreb spanning the post-colonial period remains poorly covered in academic research. Indeed, surveys are often subject to many restrictions and administrative records relating to the subject are almost inaccessible to researchers in the Maghreb countries. In addition, studies sponsored by organizations, both governmental and intergovernmental, remain too isolated and often dependent on the dominant patterns of interpretation. Our interdisciplinary symposium, open to key players in the field, will provide an opportunity to launch a process to further reflection onto the subject and to strengthen the ties between government, academic structures, and associations.

3 - The organizers

The symposium will be organized by the CERP under the EUNAM project, and this in collaboration with the Research Laboratory History Societies and Economies Mediterranean, Faculty of Humanities and Social Sciences of Tunis, the National Institute of Demographic Studies in France and the EUNAM partners.
North African countries experience a rapid shift in disease burden from decreasing rates of communicable diseases to increasing rates of noncommunicable diseases. According to WHO estimates, this trend in NA is similar to Middle Eastern countries, where by the year 2010 together with NA, communicable diseases will account for 29% of the disease burden (down from 40% in 2000) and non-communicable diseases will account for 53% (up from 45% in 2000). By 2020, the respective figures are estimated to be 20% and 60%. Results from the Global Burden of Disease Upper-income and urban areas in NA countries are mainly burdened by non-communicable diseases, having largely eliminated communicable diseases.

North Africa is characterized by infectious and genetic diseases, some of which have global distribution and impact while some are relatively new to the region. Obesity is a worldwide health problem as BMI and intra-abdominal adipose tissue are strongly correlated with cardiovascular disease and other chronic conditions. Obesity was more documented in NA females as compared to male counterparts and this observation is most marked in Egypt and Morocco. Alarmingly, there has also been an increase in obese pre-school aged and adolescent children, which can be partly attributed to the Westernization of eating habits and lack of physical activity. Cultural factors such as the perception that being overweight is a symbol of good health, higher social status, and fertility, are also contributing to this epidemic.

The marital habits of NA populations have led to a concentration of certain recessive genetic disorders, such as sickle-cell anaemia and thalassemia, which are the direct result of consanguinity in certain areas. While these two diseases are already known to the medical community in Europe, a less prevalent hereditary autoinflammatory disease is familial Mediterranean fever, a condition common to countries in the Eastern Mediterranean area. Consanguineous marriages are common in some NA countries, particularly in Tunisia. Genetic disorders are thus common in Tunisia where recessive conditions, such as hemoglobinopathies, thalassemia, sickle cell disease and familial Mediterranean fever are common. The carrier prevalence of hemoglobinopathy is estimated at 4.5%, reaching 12.5% in some endemic regions. The large and consanguineous Tunisian families have contributed to the description of a number of new autosomal recessive conditions and to identify new loci and genes. Data is lacking on the prevalence of many common diseases in the NA counties. For example, systematic reviews on all major neurological diseases, such as epilepsy, stroke, parkinsonism show such deficits.

Cancer is a worldwide phenomenon, with nearly every country being touched by one form or another. NA reflects a unique pattern of cancer types, directly attributable to lifestyle habits and influenced by the rate of microbial infections, nutritional imbalances, and exposure to environmental toxins. The five most common types of cancers endemic in the NA region are bladder, cervix and uterus, liver, stomach, and nasopharyngeal, all caused by infectious agents such as Schistosoma haematobium, HPV, HBV, HCV, Helicobacter pylori, and EBV. NA countries do not present uniform cancer rates for all cancers, and the rate often depends upon the country’s underlying disease epidemic. Examples include Egypt which has a significant Liver cancer rate due to the local HCV epidemic and Morocco’s high rate of cervical or uterus cancer due to many cases of HPV infection. Based on data from local cancer registries, the overall cancer incidence in NA is lower than in Germany/France. Nasopharyngeal cancer risk is higher in the Maghreb than anywhere else in Europe but still lower than in Southeast Asia; the reason is assumed to be infection with the Epstein-Barr virus. Bladder cancer is common in Egypt and Libya, where the carcinogenic effects are likely to be mediated by inflammation due to schistosomiasis. Lung cancer in men is highest in Tunisia and Algeria but still lower than in Central Europe; the female rates are lower than anywhere in Europe. Liver cancer is common in Egypt due to hepatitis B (HBV) and C viruses (HCV), which are at the level of Italy. The burden of hepatocellular carcinoma has been increasing in Egypt with a doubling of the incidence rate in the past 10 years. This has been attributed to several biological (e.g. hepatitis virus infection) and environmental factors (e.g. aflatoxin). Other factors such as cigarette smoking, occupational exposure to chemicals such as pesticides, and endemic infections in the community, such as schistosomiasis, may have additional roles in the etiology or progression of the disease. Previously, there was strong evidence that HBV was the major cause of hepatocellular carcinoma in Egypt, but more recently HCV has become the predominant factor associated with the more recent epidemic of hepatocellular carcinoma. It has been well documented that Egypt has one of the highest prevalence rates of HCV infection in the world.
In terms of infectious diseases, TB remains one of the most significant public health issues in North Africa (NA), with the highest prevalence on the Western front (Morocco) and 400,000 new cases reported in 2012. Constant epidemiological surveillance is required to ensure that these numbers do not climb. Hepatitis viruses (B and C) are of intermediate endemicity in NA, except for Egypt which harbours the highest HCV prevalence globally. Correct implementation of blood screening practices, sterilized medical equipment, and administration of the Hepatitis B virus vaccine are necessary to maintain this prevalence level. HIV-1 prevalence is low in the local NA population and originates predominantly from Sub-Saharan Africa and many migrants are using NA as a transit point into Europe, thereby bringing non-B strains as well as recombinant and drug resistant forms. Increased viral diversity has been suggested in recent years, with an increase of non-subtype B ad recombinant forms. Leishmaniasis is mostly found in Cutaneous form and is mainly restricted to Algeria in NA, yet can be found in a belt spanning the whole NA region. Complicating the situation is its comorbid association with HIV-1. Malaria is not endemic in NA per se but poses a risk of re-emergence due to migratory Sub-Saharan Africans transiting through the region. The majority of NA countries have been declared malaria-free in the last few years.

Diabetes is emerging as a multi-factorial metabolic disease that ties into the issue of obesity, lifestyle habits, genetics, with the average prevalence in the NA region hovering around 10%. The heterogeneity across the MENA region in terms of development, urbanization, quality of health care has the potential to impact disease diagnosis, progression, and outcome. Worrisome is the fact that many cases in Tunisia, Algeria, and Egypt go undiagnosed. There is a growing concern that national prevalences might increase due to impaired glucose tolerance and the increase of Type-2 diabetes in children. An important aspect is the temporality between risk factors and disease development, more specifically nutrition and physical activity and the impact on gene interaction the natural history of the disease.

- Objectives:

The objective of this workshop will be to compare and present the health systems in NA with an emphasis on its strengths and weaknesses and also to provide a picture of disease spectrum in NA with an update on communicable diseases and non-communicable diseases.

- Communicable diseases: discussion of epidemiological situation of infectious diseases in the North African region, with focus on changing patterns, migration, and the NA region acting as a transit point between Sub-Saharan Africa and Europe. Infectious disease re-emergence is also an important point to consider in terms of public health.

- Non-communicable diseases: the workshop will focus on cardiovascular diseases, obesity, diabetes, as well as cancers and their risk factors.

- Immigration and Health: repercussions of disease panorama in NA to Europe.

III. EUNAM TRAINING FELLOWSHIPS

EUNAM awarded training fellowships to 4 persons (1. Natascia Rinaldo, 2. Khalid Moumad, 3. Chyamaa Marouf and 4. Iman Meziane) for a longer stay in the partner institutes. Details of these exchanges are given below.

1. CURRICULUM VITAE of Natascia Rinaldo [rnlnsc@unife.it]

In March 2013 I graduated at the University of Ferrara with a master degree in Anthropology with Prof. Emanuela Gualdi. Final mark: 110/110 with honors.

Till 1 October 2013 to 31 March 2015 I’m having a grant within the European project EUNAM – EU and North African Migrants: Health and Health System. Title of my project: “Health, nutritional status and body image in women with North African origin”.

SUMMARY OF WORK

From 1 October 2013 till now I have worked in my project titled “Health, nutritional status and body image in women with North African origin”. This project intended to analyze the relationship between stress, psychological distress and health status in immigrant women from North Africa in comparison to women still living in North Africa and to a control sample of Italian women. The stages of the project have consisted in: 1. Training preparation and organization of the project with the involved partners, 2. Data collection of the anthropometric measures and the psycho-social questionnaire on immigrant NA women in Italy, Italian women as control group and NA women living in North Africa by analysis in loco (Tunisia and Casablanca); 3. Statistical analysis of the data collected; 4. First results presented at the EUNAM meeting at Malta; 5. Tutorial for participants in the International Course on Health and Immigration (Ferrara, Italy, September 22-24, 2014); 6. Results reported in a scientific paper (manuscript in preparation).

Furthermore during this period I collaborated in drafting a paper on the nutritional status of children of immigrants (Gualdi-Russo et al, 2014) and on techniques for the assessment of nutritional status in immigrants (Rinaldo et al, 2015). The paper on the research conducted on the nutritional status of North African female immigrants and residents in Tunisia and Morocco is under preparation with the cooperation of the Eunam Partners. Finally I am writing a review of nutritional status and body image perception among
immigrants in Europe.

Publications

BENEFITS TO THE CANDIDATE AND TO THE OTHERS
During the period of time in which I worked within the EUNAM project I did a training preparation consisted in acquiring the anthropometrical methods necessary to assess the subject's nutritional status. Thanks to this training I improved my knowledge about assessing nutritional status and in the major factors influencing the body image misperception, the beauty ideals and in general the health of immigrants. During the North African stage I was able to share the anthropometric techniques that I've learned with the EUNAM partners and their local staff for the assessment of the nutritional status. Furthermore during this period I could talk over the different aspects of the health status of North Africans, immigrants and not. Finally I collaborated in the tutorials on anthropometric methods for assessments of nutritional status in immigrants during the international course held in Italy.

2. Full name: Khalid Moumad / Nationality: Moroccan
January 2014-present: Visiting scientist (Postdoctoral trainee) at German Cancer Research Center (Molecular Genetic Epidemiology) funded by EUNAM.

Education
2013 PhD in Virology & Molecular Biology, Hassan II University Mohammedia, Morocco
2009 Master in Microbiology & Bio-engineering, Hassan II University Mohammedia, Morocco
Grant support
2011 German Federal Ministry of Education and Research
2009 Pasteur Institute of Paris Scholarship

Long term visits
German Cancer Research Center (Molecular Genetic Epidemiology), Heidelberg, Germany (5 months)
Karolinska Institute (MTC department), Stockholm, Sweden (3 months)
Paoli Calmette Institute, Inserm 891, Marseille, France (6 months)

Work summary
Nasopharyngeal carcinoma (NPC) is a common cancer in North Africa, including Morocco. Although Epstein-Barr virus (EBV) is a known risk factor for NPC, it is not understood why NPC shows such regional incidence differences because more than 90% of population worldwide is infected by EBV. North African migrants to Europe show high risks of NPC suggesting that early infections or genetic risk factors are important in NPC susceptibility.

A recent genome-wide association meta-analysis study on NPC identified common single-nucleotide polymorphisms (SNPs) mapping to 4 independent loci that confer an increased risk for NPC. This study was conducted in a Chinese population and it is unclear whether these observations generalize to populations with different ethnicities and rates of NPC, like the North African population. In the current work, we performed an association study on 606 cases and 366 controls (Received from the NIH and Amplified by WGA) recruited from the North African population, genotyping the 8 top-associated SNPs in the Chinese GWAS meta-analysis with a replication in another Chinese population and 24 tag SNPs that cover the replicated regions in the African and the European populations. The results are under analysis.

Career Benefits
I obtained a EUNAM Long-term Research Fellowship immediately after the completion of my PhD and it has truly shaped my postdoctoral career. It boosted my international network, which is essential when applying for grants or positions. I learned a number of techniques and analysis that will be useful in my further research career. The fellowship helped me in understanding that nowadays it is essential for young researchers to be part of a network that can help solving their research questions. "Soft skills" gained through working in a different cultural context include improved language skills, increased ability to work independently and a greater sense of confidence in one's own abilities, whether scientific or personal. The contribution of these new skills when returning to the country of origin is a factor likely to encourage innovation and research for employers. The prestige of the DKFZ institution is also a factor of attractiveness for future employers.
3. Full name: Chaymaa Marouf / Nationality: Moroccan  
- October 2013-September 2014: Internship at German Cancer Research Center (Molecular Genetic Epidemiology) funded by EUNAM.

Education  
- 2015: PhD in Genetics & Molecular pathology, Hassan II University, Medical School of Casablanca, Morocco  
- 2011: Master in Physiology, Cellular and Molecular Biology, Hassan II University, Faculty of Sciences Ain Chock, Morocco

Long term visits  
German Cancer Research Center (Molecular Genetic Epidemiology), Heidelberg, Germany (1 year)

Summary of work  
Breast cancer is the most prevalent cancer in women and a major public health problem in Morocco. Several Moroccan studies have focused on studying this disease, but more are needed, especially at the genetic and molecular levels. Therefore, we investigated a number of tumor suppressor genes commonly mutated in sporadic breast cancer. In this case-control study, we examined 37 single nucleotide polymorphisms (SNPs) in 13 genes (APOBEC3A, APOBEC3B, ARID1B, ATR, MAP3K1, MLL2, MLL3, NCOR1, RUNX1, SF3B1, SMAD4, TBX3, TTN), which were located in the core promoter, 5’- and 3’UTR or which were nonsynonymous SNPs to assess their potential association with inherited predisposition to breast cancer development. A total of 226 Moroccan breast cancer (BC) cases and 200 matched healthy controls were included in this study. The analysis showed that 12 SNPs in 8 driver genes, 4 SNPs in APOBEC3B gene and 1 SNP in APOBEC3A gene were associated with BC risk and/or clinical outcome at \( p < 0.05 \) level. RUNX1_rs8130963 (OR = 2.25; 95% CI 1.42-3.56; \( P = 0.0005 \); dominant model), TBX3_rs8853 (OR = 2.04; 95% CI 1.38-3.01; \( P = 0.0003 \); dominant model), TBX3_rs1061651 (OR = 2.14; 95% CI 1.43-3.18; \( P = 0.0002 \); dominant model), TTN_rs12465459 (OR = 2.02; 95% confidence interval 1.33-3.07; \( P = 0.0009 \); dominant model), were the most significantly associated SNPs with BC risk. A strong association with clinical outcome were detected for the genes SMAD4 _rs3819122 (OR = 0.45; 95% CI 0.25-0.82; \( P = 0.009 \)) and TTN_rs2244492 (OR = 0.45; 95% CI 0.25-0.82; \( P = 0.009 \)). Our results suggest that genetic variation in driver genes is associated with the risk of BC and may have impact on clinical outcome. These preliminary findings require replication in larger studies.

Career Benefits  
I obtained a EUNAM Long-term Research Fellowship to finish a part of my PhD. I learned a number of techniques and analysis that will be useful in my further research career. In addition, the fact that the internship in DKFZ is a real chance for me. It is also a significant advantage, which allowed me again to more easily integrate the world of work, improved language skills and increased ability to work independently. In addition, live in a foreign country allowed me to discover a different culture also rewarding to me on a personal level.

4. Iman Meziane  
Personal data  
Born 13th of June, 1987  
Rottmanstr.36 69121 Heidelberg, Germany  
+49 (0)176-30651138  
i.meziane@dkfz-heidelberg.de

Education  
2014-present  PhD student at German cancer research center, Heidelberg, Germany.  
2010-2012  MSc Medical biotechnology, Faculté de médecine et de pharmacie Rabat, Morocco.  
2006-2010  BA in Biology, Health Studies minor, Faculté de sciences et technique Fez, Morocco.

Awards and Training  
- EUNAM fellowship (January2014-January2015)  
- The Enrico Anglesio Prize, IACR (International Association of Cancer Registries) 2013  
- 1st prize for poster presentation at the 1st International Symposium, Mohammed VI Cancer Center 2013, Casablanca, Morocco.

Work summary  
During my EUNAM fellowship I worked in two projects:  
- “Comparison between familial and non-familial breast cancer patients with single, contralateral, and multiple unilateral breast cancer by TNM staging at diagnosis” under the supervision of Dr. Elham Kharazmi.
“Estimating of the missing heritability of female cancers in the Swedish cancer database” Using the Generalized Linear Mixed Models, under the supervision of Dr. Hauke Thomsen. The manuscripts for these two projects are currently under-preparation. My work at DKFZ helped me to integrate the latest advancement in academic training with the experience and knowledge afforded by my seniors.

Career Benefits
DKFZ offers a broad range of course from soft skill courses to academic writing, basic statistics and coding languages. I was able to attend several of them and get involved in the scientific community here in Heidelberg.

- I also participated in organizing DKFZ: career day on "Project management". (http://www.dkfz.de/en/career-service/careerday.html).
- I was also able to join and help building the Heidelberg Unseminars in Bioinformatics (HUB), a forum for Heidelberg-related computational biologists/bioinformaticians to exchange ideas, and to discuss hot scientific topics and challenges we encounter in our work. http://www.hub-hub.de/wiki/index.php?title=HUB:About.
- I also co-organizing a journal club called “Tell me something I don't know about cancer” series focussing on thematic areas of cancer research in line with DKFZ’s objectives to fight cancer through understanding its Development mechanisms, identifying markers for Early diagnosis and optimizing Prevention as well as Treatment strategies (DEPT).

The one year EUNAM fellowship provided me the opportunity to utilize the vastly advanced platform of DKFZ to promote my scientific career a step ahead.

List of Websites:

Related documents
final1-dissemination.pdf
This project is featured in...
RESEARCH*EU MAGAZINE
Fish or seafood: feeding humanity while maintaining nature's balance
Issue 52, May 2016

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