SITUATION ANALYSIS ON OCCUPATIONAL HAZARDS AND THEIR IMPACT ON REPRODUCTIVE HEALTH IN LEBANON:

A Survey For Policy Development

2001

Study Conducted by

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Foreword

During the 2000-2002 period, the United Nations Population Fund (UNFPA) supported the Government of Lebanon, through the Ministry of Public Health and the Ministry of Social Affairs, in the undertaking of several studies related to Reproductive Health in Lebanon, covering situation analysis, needs assessment and socio-cultural research. This publication represents one of the following eight studies:

- Review of Reproductive Health Concepts in Medical and Paramedical curricula in Lebanon. 2000
- Mapping of Primary Health Care Centers in Lebanon. 2000
- Review of Reproductive Health Research in Lebanon. 2000-2002
- Situation Analysis of Reproductive Heath in Lebanon. 2001
- Information, Education, and Communication Priorities in Reproductive Health in Lebanon. 2001
- Clients' Perception of Reproductive Health Services Provided in Selected Clinics in Lebanon. 2001
- Situation Analysis on Occupational Hazards and their Impact on Reproductive Health in Lebanon: A Survey for Policy Development. 2001
- Equipment Utilization Review Study in Reproductive Health Settings. 2002

The aim of these studies is to make available substantive information and data on the current situation in reproductive health at the levels of services, human resources, awareness and information dissemination, commodities, clients' satisfaction, research, and policy development. The findings and recommendations of these studies constitute key inputs to address needs and gaps, to improve the quality of services and of information, and to formulate policies and strategies.

Undertaken by national experts, the studies also benefited from substantive contributions from a number of people and institutions whose assistance is gratefully acknowledged. Particular appreciation is expressed to the Reproductive Health teams at the Ministry of Public Health (MOPH) under the leadership of the Director General Dr Walid Ammar, and at the Ministry of Social Affairs (MOSA) under the leadership of the Director General Ms Nimat Kanaan. Special thanks also go to the World Health Organization (WHO) for its technical input, to the International Labor Organization (ILO) for its technical and financial contribution, and to the United Nations Foundation (UNF) for its financial support.

Yves de San
UNFPA Representative, Lebanon
2002

Note: The views and opinions expressed in these reports are those of the authors and institutions, and do not necessarily reflect those of the United Nations Population Fund (UNFPA) and/or relevant funding, implementing and executing partners.

Before reading this report, the reader should refer to specific sections of the project proposal submitted by the Public Health & Development Sciences Programme, Faculty of Health Sciences at the University of Balamand to the United Nations Population Fund and the International Labour Organisation. Based on this proposal this study was approved by the both UN agencies for financing. The proposal will clearly explain the background to this study, its objectives, study design and methodology.

This report presents the background and objectives of the first phase of the study, the design and sampling strategy used to achieve these objectives, highlights the initial preliminary findings concerning the sampling methodology and the conclusions drawn from them, as well as defining future work to be conducted in the second phase of the implementation of this project.

The execution of the first phase of this study extended from Mid-January 2001 till Mid-August 2001.

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List of Acronyms

ACGIH..... American Conference of Governmental Industrial Hygienists
BEI..... Biological Exposure Indices
BOHS..... British Occupational Hygiene Society
EDCs.....Endocrine Disrupting Chemicals
EHC..... Environmental Health Criteria
HSE.....Health and Safety Executive
IPCS.....International Programme for Chemical Safety
ISCO.....International Standard for Industries Classification
ISIC.....International System for Industries Classification
LBC.....Lebanese Broadcasting Corporation
LD_{50}..... Lethal Dose 50
MTV..... Murr Television
NIOSH..... National Institute for Occupational Safety and Health
NRHP..... National Reproductive Health Policy
OEL..... Occupational Exposure Limit
OES..... Occupational Exposure Standard
PVC..... Polyvinyl Chloride
PD..... Public Health and Development Sciences
RH..... Reproductive Health
SMEs..... Small and Medium Size Entreprises
TLV.....Threshold Limit Value
UKOH.....United Kingdom Occupational Hygiene Society
WHO.....World Health Organisation

Executive Summary

Introduction

Current literature is demonstrating an association between work exposures to xenobiotics and adverse reproductive outcomes. Employees have a fundamental right to work in an environment free of significant reproductive heath risks. In Lebanon, to the knowledge of the research team no information is available on the relationship between occupational hazards and reproductive health in the manufacturing industry.

Aims and Objectives

Research objectives include assessing qualitatively and semi-quantitatively the exposure to and distribution of occupational hazards and their impact on reproductive health, while the development objectives include increasing worker/employer awareness concerning occupational hazards and their risks to reproductive health, and providing real time situation analysis for decision-makers, thus assisting in developing a integrated and more comprehensive reproductive health policy.

Study Design and Methodology

The methodology of Phase I of this study consisted of an update of the literature review, an update of the data on the population at risk, identifying target industries/occupations in Lebanon, categorisation of industries according to hierarchy based on the toxicity of occupational hazards to reproductive health, and choice of target industries, choice of reproductive health outcomes, development of the questionnaires, and finally data collection and walk-throughs.

In this study, carpentry/furniture, ink/paint making and shoe making industry were considered as high-risk margin groups; while pottery and metal working industries were categorised as low-risk margin industry. Still-birth and spontaneous abortion were the reproductive health outcomes that were in focus.

Results/Discussion

Preliminary results are indicating that research into reproductive health hazards is gaining momentum, and the list of industry/occupations that are now associated with this public health issue is continually growing. The estimate number of Lebanese workers potentially at risk from exposure to hazards to reproductive health amounts to ~344,000; while the general population that is potentially at risk is 1,651,000. This is a notable number to take into considerable account, when setting a reproductive health policy. A estimate quantitative profile was done for the manufacturing industry vis-à-vis the relationship between occupational hazards and reproductive health.

Although the study suffered a significant non-response ratio, both among control and exposed groups, yet the collated results from Phase I strongly indicate that the reproductive health is an issue of concern when studied in relation to occupational hazards. The researchers were not able to compare these results with any studies that have been

conducted previously in Lebanon; nonetheless the result relate to what have been reported in the international medical sciences literature.
The size of the population whose reproductive health is directly or indirectly affected by occupational hazards is large and should not be neglected in a NRHP. It appears that the main stakeholders (i.e. employers/employees) are both unaware of the implications of neglecting the occupational health issues in their workplace and its impact on workers health and the productivity of industry. The challenge is how to integrate this issue in the NRHP through widening its scope without major additional costs to the national economy. This could perhaps be achieved if channelled through national primary health care units.

The second phase of the study will look at the burden of this matter on the national economy. This will make the task of the decision-taker clearer on how to design intervention strategies.

The way forward might be through the mandated government bodies with support of the UN-system especially UNFPA, ILO and WHO. Guiding government to sign on international conventions (e.g. those mentioned in the original study proposal) and to enact and to enforce local legislation that will respond to the principles of these conventions, might assist in tackling this public health issue. Designing a public/occupational health awareness campaign may be a catalytic factor leading to an integrated multi-stakeholder intercession.

Last but not least, particular effort should be done by all stakeholders for integrating this occupational/reproductive health issue in research and development agenda of concerned local, regional and international agencies as well as their related budgets.

An Outcome

An abstract of this study was accepted for presentation in the Occupational Hygiene 2002: Promoting a Healthy Working Environment, Culters Hall, Shefield, 9-11 April, UK. This annual European-wide conference and exhibition for all health and safety professionals is hosted by The British Occupational Hygiene Society, UK (see appendix II for the letter of approval).

I. Study Background

The study background is very well developed and presented in the project proposal explaining and highlighting the relation between reproductive health and quality of life, and their relationship with the occupational environment. It also sheds light on the profile of the industrial sector and the workforce in Lebanon, as well as hazards to health found in the industrial workplace.
For any further information please refer to the project proposal.

II. Research & Development Objectives of the Project

This research project has two types of objectives that can be explained as follows:

II.1. Research Objectives

- Identify qualitatively the presence of reproductive health hazards in the Lebanese occupational environment.
- Assess semi-quantitatively the exposure to and the distribution of reproductive health hazards in the Lebanese occupational environment.
- Characterize the direct and indirect potential risks of reproductive health hazards on the working population.
- Semi-quantify the number of working population potentially at risk and attempt at estimating the potential burden of such risks on the national economy for better RH hazard management.

II.2. Development Objectives

- Increase worker/employer awareness on reproductive health hazard and risks to health associated with them.
- Structure partnership between international organisations, academia and the private sector in the area of reproductive toxicology an occupational health.
- Enhance research potential capacity at newly emerging national research facilities.
- Widen the scope of the NRHP through the integration of the objectives of this intervention within its range of activities.
- Provide real-time situation analysis for decision makers in the area of reproductive health to draw conclusions and develop RH policy and programme.
- Raise the profile of occupational health among the different departments of the public administration and attempt at mobilizing it towards an integrated approach to occupational health and hygiene service.

III. Study Design and Methodology

The situation analysis study consists of two inter-dependant phases. Phase one extended from mid January till mid August 2001. (Please refer to project proposal for more details on the time-frame of the phases).
This report focuses mainly on describing the work that has been achieved during Phase I.

III. 1. Identifying Target Industries

III.1.1. Update of the Literature Review

An update of the literature review was conducted covering the articles published during the period 1999-2001 and tackling occupational hazards and reproductive health. The literature review, led to the updating of the table titled "List of chemicals found in occupational and industrial settings, that affect the worker's reproductive capacity according to the literature review done specially for this study". (see Appendix I in project proposal and its updated version in Appendix I: Table1 in this report).

III.1.2. Update of Data on Population at Risk

According to the project proposal, the main aim of Phase I of this study is to collect updated information on local industry profile (type, number of workers, etc.), in order to help the researcher in drawing a base map of the potential distribution of the workforce at risk from exposure to reproductive health hazards.
Accordingly, occupations were classified into 4 main sectors: industrial sector, agricultural sector, health care sector, and miscellaneous which includes the service sector occupations such as taxi drivers, fire fighters, etc.
The fact that human and financial resources and time are limited the research team decided to focus on the industrial sector (manufacturing), aiming at covering the other sectors in later studies.

III.1.3. Identifying Target Industries/Occupations in Lebanon

Statistics [59,60,61] from the Ministry of Industry, Ministry of Social Affairs, concerned syndicates and the Lebanese Industrial Association were gathered to match the list in appendix I, table1 to the present profile of industries/occupations in Lebanon. This led to identification of the number of industrial units and workers present in the Lebanese industries (occupations) that host occupational hazards affecting reproductive health (see Appendix I, Table2).

III.2. Choice of Industrial Sectors for the Study

III.2.1. Classification of Industries by Level of Risk of Occupational Hazards to Reproductive Health

❒ **Occupational Hazards and Reproductive Health**

Risk hierarchy for occupational hazards was evaluated in relation to the potential number of reproductive health effects it is related to. (see Appendix, Table3.a.). Ranking was done as follows:

Five, 4, 3, 2, and 1 point(s) were given for any occupational hazard causing >9, 7, 6/5, 4/3, <2 reproductive health outcomes, respectively.

❒ **Occupational Hazards and Gender**

Risk hierarchy for occupational hazards was evaluated in relation to gender (see Appendix I, Table3.b.). Ranking was done as follows:

Four points were given for any occupational hazard affecting both males and females, while only 1 point for occupational hazards affecting either males or females.

❒ **Occupational Hazards and Target Organs**

Risk hierarchy for occupational hazards was evaluated in relation to the potential number of organs it affects in the body (see Appendix I, Table 3.d.). Ranking was done as follows:

Five, 3 and 1 point(s) were given for any occupational hazard affecting >7, 6-4, and <3 organs, respectively.

III.2.2. Classification of Industries by Toxicity of the Occupational Hazards

❒ **By Route of Entry**

Risk hierarchy for occupational hazards toxicity profile for each type of industry was evaluated in relation to the potential number of routes through which it can enter and affect the body.

It is logical that chemicals with more routes of entry demonstrate more risk than chemicals with fewer routes of entry (see Appendix I, Table 3.c.). Ranking was done as follows:
Four, 3, and 2 points for hazards having 4, 3 and 2 routes of entry, respectively.

❒ **By Carcinogenicity Potential**

Risk hierarchy for occupational hazards toxicity profile for each type of industry was evaluated in relation to whether they are carcinogenic or not (see Appendix I, Table 3.e.). Ranking was done as follows:

Five and 3 points for occupational hazards causing >1 and 1 type of cancer, respectively; while non-carcinogenic hazards got one point.

❒ **By Lethal Dose 50**

Risk hierarchy for occupational hazards toxicity profile for each type of industry was evaluated in relation to their dose that is lethal to 50% of the exposed population called the LD50 value. This value is measured in mg/kg (see Appendix I, Table 3.f.).

It is logical that chemicals with lower LD50 values demonstrate a higher risk. Ranking for LD50 was done by a factor of ten, as follows:

Four, 3, 2, and 1 point(s) for chemicals occupational hazards having LD50s in the range of 10s, 100s, 1000s, 10,000s mg/kg, respectively; while chemicals which do not have a LD50s got no points.

❒ **By Occupational Exposure Standards**

Risk hierarchy for occupational hazards toxicity profile for each type of industry was evaluated in relation to their Occupational Exposure Standards (OES). OES include Occupational Exposure Limits (OEL) as formulated by the Heath and Safety Executive, U.K. in 1995 and Threshold Limit Values (TLVs) as formulated by American Conference of Governmental Industrial Hygienists, U.S.A. in 2000.

The value of the OES is expressed either in ppm or in mg/m3 (see Appendix I, Table3.g.). Chemicals with low OES usually demonstrate higher toxicity. Based on the above assumption, the risk hierarchy was evaluated as follows:

Chemicals with OES in ppm values was ranked by a factor of ten as follows:

Five, 4, 3, 2, and 1 point(s) for chemicals occupational hazards having OES in the range of 0.01, 0.1, 1, 10, and 100 ppm, respectively; while chemicals which do not have an OES got no points.

If the value was not available in ppm units, then OES values were used in mg/m3 unit.

Five, 4, 3, 2, and 1 point(s) for chemicals occupational hazards having OES in the range of 0.001, 0.01, 0.1, 1 and 10 mg/m3, respectively; while chemicals which do not have an OES got no points.
In cases where chemicals had an OES in either ppm or mg/m3, the ppm value were used as most OESs are reported in ppm. OES values were obtained from NIOSH(43), ACGIH(45), WHO/IPCS [35].

III. 3. Risk Rating of Target Industries

III.3.1. Risk Hierarchy by Type of Industry

The research team calculated the toxicity level found in each industry/occupation by adding up the risk hierarchy evaluation of different chemicals used in the same occupation/industry. These toxicity levels were obtained by adding up the ranks that each chemical obtained in Appendix I, Tables 3a, 3b, 3c, 3d, 3e, 3f, and 3g (see Appendix I, Tables 3.h. & 3.i.)

III.3.2. Target Industries Summary Profile

Information about each industry/occupation are shown in Appendix I, Table 4 which summarises for each industry/occupation its ISIC code or ISCO code, and the Lebanese code, whether it is found in Lebanon or not, the chemicals used, the rank of this industry according to the total toxicity evaluation of these chemicals as per Table 3.i. in Appendix I, whether the workplace is hazardous to males or females, what reproductive health outcomes these chemicals are related to and how many units of industries are found in Lebanon in addition to the estimated total number of workers in these units.

III.3.3. Choice of Target Industries (Study Group)

Out of the above, the research team semi-classified industries according to the risk to reproductive health into high-risk-margin industries/occupations, or low-risk-margin industries/occupations. Industries that ranked between 225 and 20 were considered in the high-risk margin, whereas industries that ranked lower than 20 were considered in low-risk margin (see Appendix I, Table 4).

The target industries for this study were chosen based on the following criteria:

- Present in Mount Lebanon.
- The industry is potentially hosting reproductive health hazard (see Appendix I, Table 4).
- The number of units available in Lebanon more than 50 units, out of which 10 industries will be randomly selected.
- It contains appreciable number of workforce to be interviewed (between 5 and 20 workers, thus defined as a SME).

According to plan, 6 types of industries/occupations were targeted. These 6 types were selected according to risk evaluation as: three from the high risk margin, two from the low risk margin, and one control group.
The sample size (i.e. # of industrial units) targeted was ten from each group, making a total of 60 industrial units.

III.4. Choice of Reproductive Health Outcomes

In order to decide which reproductive health outcomes to focus on in this study the following conditions were studied:

❒ **Frequency Of Reproductive Health Outcomes**

A list of all the reproductive health outcomes reported in the literature was prepared (see Appendix I, Table 4). The frequency of reproductive outcome reported was noted. Also the effect on gender was another decisive factor (See Appendix I, Table5).

❒ **Association With Other Reproductive Health Outcomes**

The association of a reproductive health outcome with other reported outcome was another decisive factor.

❒ **Measurability Of The Reproductive Health Outcomes**

The measurability of the reproductive health outcome with the context of financial resources, invasiveness, social and cultural obstacles and time limitations was also a factor for reproductive health outcome selection.

III.5. Development of The Questionnaires

During the process of questionnaire development, it was not possible to identify pre-developed and tested questionnaires tackling the hypothesis under study. After implementing a search for such questionnaires and after developing contacts with the United Kingdom Occupational Hygiene group (UKOH), the research team received a questionnaire from a research project implemented in Malaysia, the questionnaires was too general and did not serve the objectives of this study.

Accordingly, the research team had to design a new questionnaire to use in this research study.

Based on the choice of industries to be visited, and the reproductive health outcomes to be assessed in this study, 3 questionnaires were developed: one for the management, one for male workers and one for female workers (see Appendix II)

The questionnaires were developed with the assistance and guidance of Ms. Mathilde Azar (Coordinator of the French Nursing Program, Faculty of Health Sciences, University of Balamand, Specialty: D.E.A. Nursing and Midwifery) and Dr. Salim Adib (Assistant Professor in Epidemiology, Kuwait University, MD, Dr. P.H.).

The questionnaires designed for workers included the following parts:

❒ **Demographic Variables**

This part includes questions about age, gender, nationality, level of education, home address, marital status, family size (#of children), and income.

❒ **Occupational History**

This part concentrates on the workers occupational history: place of work, duration, type of work, type of industry/organisations, address of industry or organisation.

❒ **Occupational Environment**

This part enquires about the workers knowledge of the existence of any general health hazard or reproductive health hazards in the working environment.

❒ **General Health**

This part asks about the workers general health and life style such as: health ailments, cigarettes, alcohol, or nargila consumption.

❒ **Reproductive Health**

This part asks about whether the worker had any reproductive health outcomes. The

questionnaire also enquired about the reproductive health of the partner.

❒ **Family Reproductive Situation**

This part enquires about the reproductive health outcomes chosen for this study (spontaneous abortion and stillbirth). Questions about incidence of such cases, any treatment or medication taken for this reason, and cost of such treatment were included in this part.

❒ **Awareness on Occupational Hazards and Reproductive Health**

This part concentrates on awareness about occupational hazards on reproductive health, and sources of such information, types of mass media(37) that the worker depends on to get information.

These parts were common in males and females questionnaire with modifications to suit the workers gender. Where as the management questionnaire had other modifications such: enquiring about whether the management provides awareness material for the workers, their knowledge regarding laws concerning workers health and safety, and whether there is any government body responsible for workers health and safety.

Such questionnaires were developed to address workers satisfying the following conditions::

- ❒ Working in Mount Lebanon at the current period of time.
- ❒ Working in small or medium sized industries.
- ❒ No differentiation whether the workers were males or females.

III.6. Data Collection and Walk-Throughs

Data was collected during the walk-throughs/field visits to the target industries, where the management and workers were interviewed and asked to sign a consent form (See Appendix II: Consent Form) and then fill questionnaires (See Appendix II: Questionnaires).

The consent form used, explains the aims and objectives of the study. It is intended to be a catalytic step in triggering workers' interest in the subject to increase their awareness, regardless whether they take part in the study or not; allow the research team to enter the industry, to interview the manager and the workers, to protect personal confidentiality of provided information, and to maintain the transparency and protect the workers right of denial to participate in the study.

However, only managers signed such forms since according to them, as long as they accept then there is no need for the worker's approval.

IV. Results

IV.1. Update Of The Literature Review

The updated literature review covered articles published during the period 1999 to 2001. Approximately, 40 new research articles were found, as well as review articles such as the one by Niedhammer, I. et al. 2000[27].

Research is mainly conducted in the European Union and United States of America. The Finnish Institute of Occupational Health in Finland[66,68] and University of Nijmegen, The Netherlands[67] are publishing in this field, but the Aarhus University Hospital[17,25,35,65] in Denmark seems to be the most active in this research line.

This indicates that research tackling issues on occupational hazards and reproductive health is continually growing. More recently, the World Health Organisation under the International Programme on Chemical Safety published in 2001 the EHC 225 titled "Principles for Evaluating Health Risks to Reproduction Associated with Exposure to Chemicals"[69]. This document is intended as a tool for use by public health officials, research and regulatory scientists and risk managers.

This additional literature found helped in updating the list of occupations containing reproductive health hazards. It showed that additional workplaces are found to host occupational hazards to reproductive health such as: Hairdressers, Taxi drivers, Leather workers, Fire fighters, Anesthesiologists, Dental personnel such as Chair-side dental assistants, Health care workers, Pharmacists workers in contact with infants and children, Stainless steel welders, Ceramic industry, Navy personnel and others.

The research team observed from the literature, that some hazards affect the male reproductive system, but their adverse outcomes manifest themselves on the wife or in the offspring. As an example, exposure of a male worker to vinyl-chloride while working in PVC polymerisation industry or in rubber manufacturing industry, might lead to foetal loss by wives.

IV.2. Update on Population at Risk, and Classification of Industries

After classifying occupations into 4 main sectors: manufacturing/industrial sector, agricultural sector, health/medical sector and other miscellaneous occupations, the research team found that an estimate of the total number of Lebanese workforce at risk is ~344,000 workers, out of which ~52,000 (15.1%) workers are in the manufacturing industrial sector; ~218,000 (63.4%) in the agricultural sector; ~15,000 (4.4%) in the health and medical sector, and around ~59,000 work (17.2%) are categorized in the miscellaneous occupations (see Appendix III, Figure 1). These are the available number of workforce in occupations that potentially host hazards to reproductive health (see Appendix I, Table 2) However, these numbers are an under estimate of the real number of workers at risk due to the fact that statistics about the workforce working in many occupations is yet to be completed.

Workers exposed to occupational hazards might carry such hazards back with them to their homes so exposing their families indirectly to such occupational hazards. Since the average family size in Lebanon is 4.8(61); then the population that is potentially at risk is ~1,651,000 individuals. The numbers that are indirectly associated with the different sectors are as follows:

~250,000	**manufacturing sector**
~1,046,000	**agricultural sector**
~72,000	**health care sector**
~283,000	**miscellaneous category**

Profile of Workers in the Manufacturing Industry

In reference to information obtained from the Ministry of Industry, there exist in Lebanon around 22,000 industrial establishments with around ~114,000 workers(59). However, the estimate of the total number of units that include risks to reproductive health (see Appendix III, Figure 2) is around ~16,000 industrial units (72.7%), out of which ~10,000 are in the high-risk category (62.5%) and ~6,000 are in the low-risk categories (37.5%). (see Appendix I, Table 4).

Accordingly, an estimate of the total number of workers in the industrial sector, who are at risk (see Appendix III, Figure 3) is around ~108,000 workers, out of which ~36,000 (33.3%) work in the high-risk industries/occupations and ~72,000 (66.7%) work in the low-risk industries/occupations. (see Appendix I, Table 4).

Workers exposed to occupational hazards might carry such hazards back with them to their homes so exposing their families indirectly to such occupational hazards. Since the average family size in Lebanon is 4.8(61); therefore, the population that is potentially at risk in Lebanon from the manufacturing industry is around ~518,000 individuals, out of which ~172,000 (33.2%) in the high-risk category, and ~346,000 (66.8%) are in the low-risk category.

IV.3. Sample Distribution of Industries/Occupations

The industries chosen to be the three high-risk groups (having a rank > 20) were: (chosen depending on Appendix I, Table 3.i. and Table 4)

❒ **Carpenters/Furniture industry:** Risk hierarchy rank 87. The total number of units in Lebanon is 4,321 and the total number of workforces 16,573.

❒ **Ink/Paint making industry:** Risk hierarchy rank 80. The total number of units in Lebanon is 141 and the total number of workforces 999.

❒ **Shoe making industry:** Risk hierarchy rank 55. The total number of units in Lebanon is 1,001 and the total number of workforces 5,079.
(see Appendix III, Figure 4).

As for the choice of industries, both carpenters and furniture industry were chosen as one type of the high-risk industry. Since in the Lebanese industrial sector there is no differentiation between carpenters and furniture industry, where both occupations are being applied in the same workshop, the research team decided to consider both occupations as one category. This decision was emphasized by the fact that both occupations use the same chemicals that affect reproductive health (e.g. organic solvents.)

A similar analogy was sued to clump the ink making and paint making industries, since both use the same materials and apply the similar processes of manufacturing.
The industries chosen to be the two low-risk groups (having a rank less than 20) were: (chosen depending on Appendix I, Table 3.i., and Table 4).

❒ **Pottery workers:** Risk hierarchy rank 19. The total number of units in Lebanon is 132 and the total number of workforces 132.

❒ **Metal working industries:** Risk hierarchy rank 18. The total number of units in Lebanon is 3,554 and the total number of workforces 14,492. (see Appendix III, Figure 5).

As for the referent group, the decision was to choose bank and/or insurance companies' employees since they are administrative office workers non-occupationally exposed to repro-toxins.

IV.4. Reproductive Health Outcomes Studied

The researchers found that both factors spontaneous abortion and stillbirth were the most frequently reported outcomes (see Appendix I, Table 5). Spontaneous abortion was reported 32 times in the medical literature, still birth 20 times whereas the third reported reproductive health outcome was sperm morphology and infertility each with a frequency of 14 times. Moreover, recurrent and spontaneous abortion are associated with other reproductive health outcomes such as oligomenorrhea and oligospermia[52], respectively. This indicates that spontaneous abortion is linked risk factors making them more representative than other reproductive health end-points. Moreover, both end-points could be measured and thus assessed quantitatively[2,52].

Based on the above, the study questionnaire focused on both spontaneous abortion and stillbirth as the reproductive health outcomes to be assessed.

IV.5. Preliminary Results Of The Walk-Throughs

Data collection and visits to industries extended over the period June 2001 till early September 2001. Youssef Naddaf, a junior student from the PD Programme at the Faculty of Health Sciences, University of Balamand assisted in the data collection and field visits to industries as a part of his Project Residency Course between July and September 2001. A total number of 91 institutes were visited, and only 29 institutes accepted participating in the study, giving a response rate of 31.9%.

The 62 institutes (non-response) were not accessible due to one of the following reason:

- The managers did not accept to participate, or
- The managers were not available at time of visit, or
- The managers were too busy to meet the research team, or
- The industries were not applicable for the study because they are bigger than the needed size or did not use the chemicals in question (as an example 2 aluminium industries were visited and both do not use trichloro-ethylene which is a chemical of concern in this study).

All the 91 industries were selected randomly based on a list obtained from the Association of Lebanese Industrialists and a report obtained from the Ministry of Industry titled "Ministry of Industry, Industrial General Census in Lebanon, Industrialists in Lebanon[59].

The 91 industries are divided as follows:

High Risk Margin Industries:

- **Furniture industries:** 21 units were visited. 10 industries participated in the study. The response rate was 47.6%. The total number of workers interviewed was 52 workers.

- **Shoe making industries:** 23 units were visited. 10 industries participated in the study. The response rate was 43.5%. The total number of workers interviewed was 65 workers.

- **Ink making industries:** 6 units were visited. 2 industries participated in the study. The response rate was 33.3%. The total number of workers interviewed was 7 workers.

Accordingly, the response rate in the high-risk category that includes furniture, shoe making, and ink-making industries was 44%, and the total number of workers interviewed in the high-risk industries category was 124 workers.

Low Risk Industries:

- **Metal industries:** 11 units were visited. None of them participated or were inapplicable for the study. Five when visited where found to be inapplicable and six did not accept to participate.

Referent Group

In the referent group, 13 banks and 17 insurance companies were visited, out of which 3 banks and 4 insurance companies participated in the study, giving a response rate of 23.3%. The total number of employees interviewed in these institutions was 39 employees.

IV.6. Preliminary Results Of The Questionnaires

❒ **Target Population** (see Appendix III, Figure 6)
The total number of individuals interviewed was 163 distributed over 29 units. Out of 163 interviewed individuals, 28 were managers and 135 workers.

The 135 workers are divided as follows:
103 workers (76.3%) are from the high-risk-margin group, compared to 32 (23.7%) from the control group.

The 103 workers in the high-risk margin group were interviewed in 22 industrial units, and they are divided into 100 male workers and 3 female workers.

Out of the 100 male workers 52 were married compared to 47 single and 1 widowed.

Out of the 52 married male workers, 21 cases (40.4%) reported having adverse reproductive health effects.

Out of the 3 female workers 2 were single and 1 was divorced.

The 32 workers from the seven control institutions are divided into 15 male workers and 17 female workers.

Out of the 15 male workers 8 were married compared to 7 single. None of theses male workers reported any adverse reproductive health effect.

Out of the 17 female workers 9 were married, 7 were single and 1 was divorced. 5 married females reported having adverse reproductive health effects.

❒ **Age**
The ages of the target population ranged between: 15 and 75 years old, but the majority were in their reproductive years.

❒ **Address**
71 (52.6%) out of the 135 interviewed workers live in Maten Caza, 47 (34.8%) workers are from Baabda Caza, 7 (5.2%) from Allay Caza, 3 (2.2%) workers live in Byblos Caza, 2 (1.5%) live in Keserwan Caza, and 5 (3.7%) live in Beirut district. Therefore, the majority of the population sample lives in Mount Lebanon district 96.3%

❒ **Marital Status**
Out of the total sample of workers (meaning the 135 workers), 63 (46.7%) were single compared to 69 (51%) were married, and the rest (3 individuals) were divorced/widowed (2.2%).

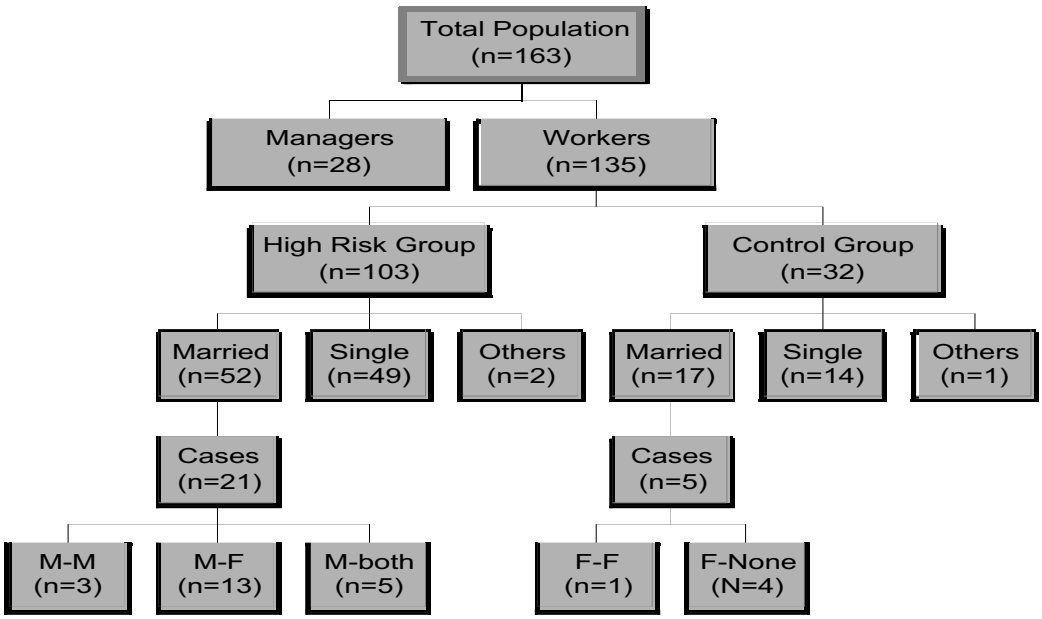
❒ **Nationality**
112 workers were Lebanese (83%) compared to 14 Syrians (10.3%) and 9 other nationalities including Jordanian, Egyptian, Indian, Palestinian, and Pakistani (6.7%).
All the 28 managers that were interviewed were Lebanese.

❒ **Level Of Education**
The level of education of the workers was as follows: 23 workers (17%) had university level education, 10 workers (7.4%) received technical education, 21 workers (15.6%) had secondary level education, 48 workers (35.6%) had intermediary level education, 23 workers (17%) had primary level education, and 10 workers (7.4%) were uneducated. Therefore, the total percentage of workers that did not reach University education is 83%.

As for the managers, 14 out of the 28 have university level education, 2 have technical education, 4 have secondary level education, 5 have intermediary level education, and 3 have primary level education.

Population Distribution

Figure 6



	High Risk Group		Control Group	
	Male	Female	Male	Female
Married	52(21 cases)	0	8	9 (5cases)
Single	47	2	7	7
Others	1 widowed	1 divorced		1 divorced
Total	100 males	3 females	15 males	17 females

1. M-M: Male reporting having RH adverse effects himself
2. M-F: Male reporting his wife having RH adverse effects.
3. M-both: Male reporting both (himself and his wife) having RH adverse effects
4. F-F: Female reporting having RH adverse effects herself
5. F-None: Female reporting that neither herself nor her husband have RH adverse

Salary Range

Salaries ranged between 200,000 LL and 6 millions LL.

Media

The most reported media source that workers reported as their main source of information was television. 131 workers reported depending on the TV as their source of information, 32 workers listen to the radio, 21 read journals, and 16 read newspapers.

Out of the 131 workers 79 (60.3%) watch the Lebanese Broadcasting Corporation (LBC), 24 (18%) watch Murr Television (MTV), and 10 (7.6%) watch Al Manar Television. The newspaper that had the highest number of readers was Al Nahar (12 out of 16 workers). The radio that had the highest number of listeners was radio Strike (10 out of 32 workers).

Reproductive Health Outcomes (see Appendix III, Figure 6)
Eight males reported having reproductive health problems, all off these males are from the high-risk margin industries and belong to the group exposed to reproductive health hazards. Five of those 8 workers reported RH problems in their partners, while the other 3 did not. The distribution of the five cases where the workers reported RH problems in their partners were: 2 cases abortion, 1 case pre-term delivery, 1 case neonatal death and 1 case did not specify the type of RH problem.

Thirteen male workers working in high-risk industries reported that their partners had one or more reproductive health problem. These 13 cases are as follows: 11 cases where the partner experienced an abortion, 1 case the partner had an abortion and Neonatal death, one cases did not specify what type of reproductive health problem their partner suffered from.

Five female workers reported having reproductive health problems. All off these females belong to the control group that is not exposed to reproductive health hazards. Out of these 5 females, 1 reported having an abortion, one reported having a pre-term delivery, one reported having a reproductive health problem without specifying the type of this problem, and the other two reported having no problem however one has been married for 10 years, and the other for 15 years and both reported not having children.

Distribution of RH Cases over Industries
The total number of cases that reported RH problems was 26, seven of which work in furniture industries, 14 in shoe making industries, 4 in banks and 1 in an insurance company. The highest frequency of RH problems reported was 5 cases in the same shoe-making industry, 4 cases in another shoe-making industry, and 3 cases in a bank.

Those 26 cases were found in 14 industries/institutions out of the 29 that were visited. Nineteen workers out of those 26 cases reported not having any awareness concerning the issue of occupational hazards affecting reproductive health. In addition, twelve managers out of the 14 reported not having information concerning the effect of occupational hazards on the general health nor on reproductive health.

Awareness of Managers
The total number of managers interviewed was 28. Twenty-five managers (89%) reported that they neither think working environment expose the workers to hazards that affect general health nor hazards that affect reproductive health. In addition, twenty-seven managers (96%) reported that workers do not transmit hazards to their families. As for implementing awareness campaigns for the workers, 15 managers (54%) reported that they implement such campaigns compared to 13 managers (46%) who said they do not. However, the topics that were addressed in these campaigns were not related to reproductive health hazards.

Over twenty-four managers (86%) reported their approval for giving information to the workers about occupational hazards affecting reproductive health. As for the organization or body concerned with occupational health and safety, the managers were not confused which organization; however most of them reported governmental bodies, mostly Ministry of Labour and Ministry of Public Health.

Moreover, concerning the media source that the managers prefer to receive information through, the majority of the managers (50%) reported that they prefer the Lebanese Broadcasting Corporation (LBC), and the Annahar newspaper (21%). As for the timing, 23 managers reported watching TV during the period 6-10 in the evening.

IV.7. Observations During Field Visits

Out of the field visits to industries, the research team observed the following:

At Level of Industrial Units

Most of the industries visited had generally very poor hygienic conditions. Moreover the personal industrial hygiene practices are by no means acceptable. The photographs in Appendix III expose these conditions clearly (see Appendix IV, Photos 1, 2, 3, 4 & 5).

The physical environment in the industries was inappropriate. Lighting and industrial hygiene ventilation were minimal (see Appendix IV, Photos 6,7,8 & 9).

Industrial units had no separate changing rooms, no rest rooms for having coffee breaks or meals etc (see Appendix IV, Photos 10, 11, 12 & 13).

There was and no special storage room for chemicals for controlling potential exposure to the chemical hazards and increasing safety measures. In fact, most chemicals were stored in tins with no labels of hazard notices on them. Very few containers had labels showing name of chemical and a flammability sign (see Appendix IV, Photos 14, 15 & 16). On the other hand, and on a positive note, it was observed that, there was usually a separate area in furniture industries especially for spraying. This might help in protecting the health of other workers from exposure to such hazards.

Many industries had closed due to the economic recession, others are working half shift, and others pay workers by piece of production. The latter could not afford the time needed in taking part in the study. Some others were not functioning due to electricity cuts.

At Level of Management (employers)

It is very difficult to enter industrial units, due to managers' non-cooperation either due to time constraints, or perhaps due to the fact that they do not want to expose their working environment to a third party. On the other hand, some were very cooperative. They allowed the research team to enter their industries. The research team encountered many types of managers such as:

- Those who do not know that their industries or occupations contain hazards that might affect reproductive health; on the contrary, they believe that their industries and workplaces are safe containing no reproductive health hazards.
- Those who know that their industries might contain hazards affecting health in general including reproductive health but do not want to do anything about it.
- Those who know that their industries/occupations might host hazards affecting health in general including reproductive health and are ready to do something about it, but need technical assistance.

The research team observed the following:

- The higher the level of education of the manager, the easier it is for the research team to deal with them and to get their approval for entering their premises meaning easier accessibility.. Most of the managers were present during interviews with the workers. This could impinge on workers privacy while answering the questionnaire.
- Management was hesitant due to fear that the research team were sent by the government.
- Many managers made the same comment saying that importing foreign products

affected negatively the market for Lebanese production leading to shutting down a number of industrial units especially shoe making industries.

At Level of Workers (employees)
Unsatisfactory safety practices were observed such as workers smoking next to flammable chemicals, and using bare fingers for gluing and putting adhesives; as well as improper posture and non-ergonomic chairs that the workers use.

No Personal Protective Equipment was used (no gloves, masks, or overalls), if there were any, they were misused or inappropriate.

Workers neither link workplace hazards to reproductive health, nor recognise the chemicals they use as chemicals or potential hazards.

Workers were very co-operative as long as management allows the research team to enter the industry; however some of them asked for financial incentives to take part in this study, while linking this request to the economic recession that is not allowing them to make ends meet.

Observations Common for Management and Workers
Both management and workers believe that there is a lack of concerned governmental bodies and a lack of legislation concerning workers health and safety.

Both management and workers were more aware of physical injuries that might occur in the working environment, but much less aware about chemical hazards they are potentially exposed to.

V. Discussion

The Literature Review

Pollution from emissions, industrial processes, fertilizers, pesticides and waste is exposing people to higher levels and a broader range of chemicals than ever before. Many chemicals that did not exist 50 to 100 years ago are now widely dispersed throughout our environment. Most of these chemicals have not been studied for their health effects. More research is being implemented on such chemicals, and many questions remain about their possible impacts on early foetal and childhood development. Since 1900, industrialization has introduced almost 100,000 previously unknown chemicals into the environment. Many have found their way into the air, water, soil, and food and human beings. Some chemicals are now suspected as important cause of human reproductive disorder and infertility[62]. The possible role of environmental agents in causing these disorders has renewed worldwide interest in developmental and reproductive toxicology. ***Recently, the US National Toxicology Program (NTP) established the Center to Evaluate Risks to Human Reproduction, the purpose of which is to conduct risk assessment on agents with potential to cause reproductive and developmental toxicity[69]. These issues are a prominent public health concern of scientists, decision-makers and the general public[69].***

Literature Review and More…

What is mentioned above justifies why more research, as spotted in the update of the literature review, is being conducted addressing the effect of occupational exposure to chemicals on the reproductive health of workers and their families.
More occupations are found to be hosting occupational hazards that affect reproductive

health. Therefore, advanced and intensive research is proving that occupations, which were once thought to be safe with regard to the reproductive health of workers, are found to be posing a potential hazard.

Risk Hierarchy in the Target Industry

The literature review did not unveil methods or tools developed by scientists to categorise/evaluate industries according to risk hierarchy. The absence of such an instrument demanded the research team to develop a novel tool for categorising industry into low and high reproductive health risk margin industry. This newly developed instrument; although it was based on a number of assumptions, it was founded on a number of criteria that are scientifically justifiable. This instrument is novel, scientific, objective and measurable and can be modified, improved and utilised by other future research in this field.

The high-risk and low-risk margin manufacturing industry that was chosen for this study employs ~22,651 and 14,624, respectively. These figures represent (~21%) and (~13.5%) of all the population at risk from exposure to occupational hazards impacting RH, respectively. Thus they are fairly representative of the population at risk.

Choice of Reproductive Health Outcome

The choice of the reproductive outcome is influenced by a number of factors. In the study of reproductive health there is a whole list of dependant variables that can be studied. Since little is known about the biological mechanisms underlying the toxicological process leading to adverse reproductive health outcomes due to scarcity of clinical research and animal studies in this domain as well as the novelty of this field of research, it becomes difficult to decide on the choice of outcome to be studied. Reproductive health indicators are mainly two types, the biologically invasive markers (such as spermatology) and the socially invasive end-points such as abortion, still-birth etc. Scientists are moving towards the former type in molecular epidemiological studies[24]. Such studies are linked to better data quality; however they usually suffer from a high non-response rate. On the other hand, the end-points used in classical epidemiological have not proven to be a powerful research tool during the last decade. Perhaps one of their major weaknesses is recall bias and multi-factorial dependence on risk factors[24].

In this study, the choice of the studied dependent variables (spontaneous abortion and still-birth) was justified in relation to the population under study and others factors such as expected response and available resources. Although, these outcomes are highly criticised in the literature and scientists are calling for more effort towards utilising molecular biomarkers in order to increase their usefulness as dosimeters for reproductive health; still it was evident in the medical literature that the chosen outcomes are the most frequently studied ones.

Questionnaire and Consent Form

The researchers were not able to identify validated questionnaires focused on testing the causal relationship between occupational hazards and the choice of reproductive health outcomes, as well as the profile of awareness of the targeted population about this issue. The questionnaire used in this study is a new one, which can be a modified, further validated and utilised by other future research in this field.

Both the questionnaire and the consent form were awareness tools themselves. An interesting point to be highlighted is the fact that managers insisted that they should sign the consent forms, and there is no need for workers to sign such forms. This may reflect how much workers are powerless. They do not have the chance even to decide whether they want to participate in such a study or not. Managers are the decision-makers even if such decisions

are addressing workers personal rights. A possible reason for this might be that in many cases managers are the employers and in the present economical recession workers might sacrifice their rights for the sake of their jobs, or they are not aware of their rights.

This observation is a useful indicator for the design of the awareness campaign. Obviously, an awareness programme cannot reach the workers directly, without the approval of the managers, thus defying the basics of free and easy access to information. This should be seriously addressed at the campaign's design stage.

Population at Risk

The preliminary results of the study indicated that the major sector posing the major potential risk to the Lebanese workforce is the agricultural sector followed by the industrial/manufacturing sector. This indicates that there is a major section of the Lebanese workforce that needs more attention and a situation analysis study. This can be conducted in further studies financed by interested development agencies.

At the Lebanese local level, quantitative estimate about occupations containing hazards to reproductive health are not non-existing. Neither the numbers of the industrial units, nor that of the workforce is available.

The workforce that is potentially at risk is estimated to be ~344,000. Since chemicals that affect reproductive health may also demonstrate developmental toxicity, it can be deduced that the estimate number of the general population potentially at risk is ~1,617,000. This constitutes about ~51% of the Lebanese population.

The total number of industrial units hosting hazards to reproductive health is ~16,000. This high number of units and their geographical distribution should be taken in to consideration when planning the RH programme and activities. A preliminary study of their geographical distribution by type of manufacturing, size and risk to health may assist in the design of the out-reach campaign. For example the bigger portion (62.5%) of those units are categorised as the high-risk-margin while they are employing the smaller portion (~33%) of the workforce at risk. The high risk margin industry employs 36,000 workers; therefore the total number of the general population linked to the high risk margin industry is ~169,000 constituting 5% of the Lebanese population while the population linked to the low-risk-margin approximately is double (11%). This distribution should be accounted for while designing our reproductive health strategies.

It is hypothesised that repro-toxic chemicals are potential endocrine disrupting chemicals (EDC). The endocrine disruption is only one of a diverse mechanisms for potentially causing reproductive and developmental effects[69]. The potential adverse health consequences of exposure to EDCs have fuelled intense public debate, media attention, international organisations, scientific societies, the chemical industry and public interest groups[69]. ***IPCS is preparing a "Global Assessment of the State-of-the-Science of Endocrine Disruptors" and has developed a Global Endocrine Disruptors Research Inventory.*** The above estimates and the global interest warrant that the workforce and the population at risk should receive considerable attention in any public health policy and programmes. All this stresses the fact that the relationship between reproductive health and the working environment can by no means be neglected in an overall national reproductive health programme.

Walk-through Results

The response rate was only 31.9%. This is very low thus affecting how representative is the sample of the study. This high non-response rate was by no means unexpected. To start with, occupational edipemiology studies are neither a common research topic at Universities nor in government related bodies in Lebanon. Moreover, the subject of reproductive health may

still be not very well presented to the general population and particularly to this sub-population (workforce in the industrial sector) and is not a part of the local culture. This may be supported by the fact that the non-response was higher in the referent group when compared to the exposed groups. Also the economical situation of the manufacturing industry might have been a major factor affecting this non-response rate that was observed. Does this observation indicate that the rate of citizens approaching RH professionals may need to be addressed? An interesting enquiry yet to be answered.

Many industries listed in the Industrial Censes[59] were visited by the research team and were found closed and non-functional. Such industries had closed due to the potential economical recession that the country is currently experiencing. According to an article published in An-Nahar newspaper dated Tuesday 16 October 2001 and titled: "Sarraf Calls for Saving Shoe Making Industry" the chairman of the Tanning industry syndicate, Mr. George Darwish said that the number of shoe making industries had dropped to only 320 units even though its number reached thousands, and the number of tanning industries dropped from 70 to 24 out of which only 10 industrial units are functional. This supports the fact that the economical situation is a factor to be addressed in such studies as well as in the design of the NRHP. Workers who might have been exposed in their previous occupation may now be part of another subpopulation of the workforce that is not potentially linked to this public health issue under study. That is why there is a need for a close look at the occupational history when studying reproductive health.

Such epidemiological studies usually suffer from non-response and new strategies to penetrate the ranks of industries needs to be developed with assistance of particular stakeholders such as the Ministry of Labour, or Ministry of Industry, or the Association of Lebanese Industries.

The awareness campaign, if well designed and specifically targeted, might enhance the penetration as it will increase the knowledge of both management and workers about the subject under study and might make tracks for future studies to reach reasonable response rates.
The contacts with concerned ministries, syndicates, and associations in order to facilitate access to the industrial units made by the research team, verbally or in writing; has contributed by default to the awareness programme.

Questionnaire Preliminary Results

At the Workers Level

The preliminary results of the questionnaire are pointing towards few particularities in this studied target group. Although the targeted sample size has not all been collected yet, some preliminary interesting findings are gathered.

The number of adverse reproductive health cases reported by males in the high-risk-magin group was 21% (21 cases out of 103 workers interviewed). This number of cases will be more meaningful if reported in the number of married males which is 52 thus giving us a percentage 40.4%; while no such cases where reported by the males in the control group. There is no doubt that the control group should be enlarged and the low-risk margin group should be sampled for developing some kind of a dose-response relationship. Such a follow up might aid in revealing the indicative power of the preliminary results gathered to date.

Nonetheless, since the specificity of the relationship between the reproductive toxins and the human physiology is not context specific to any particular human population; and since the biological plausibility of the relationship has been reported repetitively in the medical literature, the differences in the percentage of reported cases between high and low-risk-margin groups necessitates more attention and concern from all stakeholders starting with

the workers and management, ending with policy makers and decision-takers.

As with respect to the marital status of the workers an appreciable percentage is not married. This ratio points to a very important feature of this population. The hazards that they are exposed to today, may manifest adverse reproductive health effects in the future. In the absence of archives for occupational history and in view of the potential mobility of the these working population, and since these workers may manifest RH effect in the future thus making it difficult to link outcomes to potential causes such as reprotoxins in the workplace, it would be inappropriate to exclude them from the target population of the any NRHP.

At the Management Level

It is apparent from the preliminary results that the majority of mangers are not particularly aware of the hazards in the workplace that potentially affect public health at large. More particularly, they are virtually completely unaware of the relationship between workplace hazards and adverse reproductive health effects.

On the other hand, there is an appreciable percentage of the managers who are aware of their responsibility towards workers occupational health and a good percentage have identified that there are public agencies responsible for implementing laws related to this public health issue.

This perhaps indicates that the managers/employers are aware of their responsibilities; however, they are not familiar with managing hazards in the occupational environment. They also would like to be guided on these responsibilities and particularly reproductive health matters.

The preliminary results indicate that the design of the awareness programme, which may be channelled through television or radio programmes or less effectively through direct contact, should target managers as much as the workers.

Observations During Field Visits

Most of the field observation support what the preliminary results are pointing at. Neither the physical workplace environment which hosts an appreciable number of reproductive health hazards; nor good hygiene and safety practices, are acceptable in the SMEs visited. These general occupational hygiene conditions indicate that hazards are not well-recognised by the workers or managers and thus they are not well controlled. Exposure to chemicals and hazards under these circumstances may be well above occupational exposure standards and thus increasing the risk to general health and more specifically reproductive health.

General Discussion

There is a strong indication in the results of Phase I of this study that the reproductive health is an issue of concern when studied in relation to occupational hazards. The researchers were not able to compare these results with any studies that have been conducted previously in Lebanon; nonetheless the result relate to what have been reported in the international medical sciences literature.

The size of the population whose reproductive health is directly or indirectly affected by occupational hazards is large and should not be neglected in a NRHP. It appears that the main stakeholders (i.e. employers/employees) are both not aware of the implications of neglecting the occupational health issues in their workplace and its impact on workers health and the productivity of industry. The challenge is how to integrate this issue in the NRHP through widening its scope without major additional costs to the national economy. This could perhaps be achieved if channelled through national primary health care units.

The second phase of the study will look at the burden of this matter on the national economy. This will make the task of the decision-taker clearer on how to design intervention strategies.

The way forward might be through the mandated government bodies with support of the UN-system especially UNFPA, ILO and WHO. Guiding government to sign on international conventions (e.g. those mentioned in the original study proposal) and to enact and to enforce local legislation that will respond to the principles of these conventions, might assist in tackling this public health issue. Designing a public/occupational health awareness campaign may be a catalysing factor leading to an integrated multi-stakeholder intercession.

Last but not least, particular effort should be done by all stakeholders for integrating this occupational/reproductive health issue in research and development agenda of concerned local, regional and international agencies as well as their related budgets.

VI. Limitations

The limitations of this study are spelled out in the previous sections of this report. They range from the scarcity of existing data, to inadequate resources of the study, as well as the inherent restrictions of invasive occupational/reproductive health studies.

The major limitation, which led to the significant delay in the termination of Phase I of this study, was the low percentage of accessibility to the targeted population encountered during the field visits. This was expected but surely not to the extent observed.

VII. Recommendations

Operational Recommendation

Increase the sample size in the control and low-risk margin group and compare to the acquired results to date. This will surely require the extension of the project until May 2001, if approved by funding agencies.

Call for and advisory group meeting to discuss the results of the study and design of Phase II.

Initiate the awareness campaign targeting the managers and employees of these industries. Trigger the process by drafting a press release to be co-signed by the Minister of Public Health and Minister of Labour or the industrialist and workers unions.

Strategic Recommendation

Send a letter co-signed by UNFPA and ILO representatives to Minister of Public Health and Minister of Labour asking them to push for the signature of the International Conventions related to this public health issue.

Correspond with the UN-System and the USA-based initiatives on reproductive health issues that are mentioned in the text.

Correspond with the Department of Epidemiology and Biostatistics, Finnish Institute of Occupational Health, Helisinki, Finland and the Steno Institute of Public Health, Department

of Occupational Medicine, Aarhus University Hospital, Denmark in order to explore avenues of collaboration with those bodies who are actively involved in research addressing the subject of this study.

Correspond with the Arab Labour Organisation and the Arab Institute for Occupational Health and Safety at the following address: Director of Institute, Syrian Arab Republic, P.O.Box: 5770, Damascus, Syria.

Stakeholders should assist in mobilising funds for research and development in the subject of occupational and reproductive health and particularly in non-classical epidemiological studies that have proven of less value when addressing this issue. More effort should focus on molecular epidemiological studies.

VIII. Conclusion

This study is a situation analysis for policy making; however, any recommendations that will be put forward for policy making should take into consideration the difference in interests between management (business), workers (people), and decision-takers (government). No one has described the dilemma better than the UN-High Level Advisory Board Member, Captain Jacque Yves Cousteau…

> *"Today no one seems to take responsibility for the future. Why? People lack objective information, governments are subjected to short-term electoral concerns and businesses to pluriannual examinations of their financial health. Our whole society structure completely neglects the long-term consequences of major decisions. And the United Nations, which should be caring for the future, cannot take decisions but only makes recommendations. These are the major weaknesses that we must fight with all possible means."*

If one reflects on this it would be clear to all that the main aim of the management is to continue production and to make profit, whereas for workers' aim is to continue working to make a living especially during the potential economical recession that the country is going through. Therefore, any recommendation that will be reached from this research project has to keep in mind the economical difficulties the industrial sector is facing.

Appendix I

Table 1

List Of Chemicals Found In Occupational And Industrial Settings That Affect The Worker's Reproductive Capacity According To The Literature Review Done Specially For This Study.

Table 2

Distribution Of Industries/Occupations With Reproductive Health Hazards As Found In The Literature Review Carried Out Especially For This Study Showing The Number Of Such Industrial Units Or Occupations Present In Lebanon, And The Number Of Workforce (And Employees) Found In Such Industries/Occupations Classified According to Gender

Table 3

3.a. Chemical vs Reproductive Health Outcomes
3.b. Chemical vs Gender
3.c. Chemical vs Route of Entry
3.d. Chemical vs Target Organs
3.e. Chemical vs Carcinogenicity Potential
3.f. Chemical vs Lethal Dose 50
3.g. Chemical vs Occupational Exposure Standards
3.h. Risk Hierarchy of Chemicals in Relation to All Risk Factors
3.i. Risk Hierarchy of Industries in Relation to All Occupational Hazards (Chemicals) Present in their Premises

Table 4

A table summarizing the different ranking results and indicating the toxicity level found in each industry by adding up the toxicity levels of the different chemicals used in the same occupation or industry according to the total toxicity level of these chemicals as found in the toxicity matrix tables, whether they affect males or females, what reproductive health outcomes these chemicals have and how many units of industries are found in Lebanon in addition to the total number of workers in these units.

Table 5

Ranking The Frequency Of Reporting Male And Female Reproductive Effect, According To The Medical Literature Used In This Study

Table 1

List Of Chemicals Found In Occupational And Industrial Settings That Affect The Worker's Reproductive Capacity According To The Literature Review Done Specially For This Study.

RH hazard	Workplace/ process	M/F	Potential health effect
Anesthetic gases	Anesthesiologists, chair-side dental assistants	F	Spontaneous abortion
Benzene, toluene, xylene	*****	F	Menstrual disturbances associated with abnormal bleeding
Cancer treatment drugs (e.g. methotrexate)	Health care workers, pharmacists	F	Infertility, miscarriage, birth defects, low birth weight
Carbon disulfide and benzene	Many, viscose rayon workers	F	Menstrual abnormalities
Chlorophenoles, aromatic amines	Leather work	F	Small for gestational age children SGA
Cytomegalovirus (CMV)	Health care workers, workers in contact with infants and children	F	Birth defects, low birth weight, developmental disorders
Cytotoxic drugs	Nurses	F	Menstrual irregularity and amenorrhea
Estrogen	Estrogen plant workers	F	Inter-menstrual bleeding
Ethylene glycol ethers, xylene, toluene, trichloroethylene, trichloroethane phenols, isopropyl alcohol, arsine gas, boric acid, thallium, lead, cadmium, radio frequency, ionizing radiation, 2-methoxyethanol (2me), 2-ethoxyethanol (2ee)	Semiconductor industry	F	Fetal loss, miscarriage
Ethylene oxide	Many	F	Spontaneous abortion
Exposure to mixtures	Laboratory workers, pulped paper industry	F	Increased risks of central nervous system, heart and oral cleft defects
Formaldehyde	Biology, ink making, and embalming	F	Menstrual disorders
Fungicides		F	Cause a delay or difficulty in reproduction
Heavy metals + pesticides + petroleum exposure	US navy women	F	Adverse live birth outcomes
Hepatitis b virus	Health care workers	F	Low birth weight
Human immuno-deficiency virus (HIV)	Health care workers	F	Low birth weight, childhood cancer
Human provirus b19	Health care workers	F	Miscarriage
Hydrocarbons	Petrol workers	F	Women> 40, menstrual disorders
Ionizing Radiation (E.G. x-rays And Gamma Rays)	Health care workers, dental personnel, atomic workers	F	Infertility, miscarriage, birth defects, low birth weight, developmental disorders, childhood cancers
Lead	Battery makers, solderers, welders, radiator repairers, bridge re-painters, firing range workers, home re-modelers, pottery workers	F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)

Long time standing	Laboratory workers	F	Low birth weight, miscarriage.
Nickel	Refinery workers, production workers	F	Affect developing embryo, induce hyperglycemia, decreased early and late resorption and increase frequency of stillborn fetuses
Organochlorides and DDT	Agricultural workers	F	Abnormal menses and improved fertility, premature delivery, and spontaneous abortion
Perchloroethylene	Dry cleaning plants	F	Menstrual disorders including cycle length, menorrhagia, dysmenorrhea, and pre-menstrual syndrome
Perchloroethylene	Hairdressers	F	Dysmenorrhea, painful menstruation
Pesticides	Flower greenhouse workers	F	Reduce fecundability (fertility)
Rubella (German measles)	Health care workers, workers in contact with infants and children	F	Birth defects, low birth weight
Strenuous physical labor (e.g. prolonged standing, heavy lifting)	Many types of workers	F	Miscarriage late in pregnancy, premature delivery
Stress		F	Menstrual disorders, pregnancy induced hypertension, eclampsia, spontaneous abortion (in high strain jobs)
Toxoplas-mosis	Animal care workers, veterinarians	F	Miscarriage, developmental disorders, birth defects
Trinitrotoluene (TNT)	Explosive manufactory	F	83% experienced change in their menstrual cycle; symptoms diminished to 65% and 20% after 1 and 2 years post exposure respectively
Varicella-zoster virus (chicken pox)	Health care workers, workers in contact with infants and children	F	Birth defects, low birth weight
Venylchloride or styrene	Workers who processed or polymerized plastics made up of vinyl chloride or styrene	F	Spontaneous abortion, decreased birth weight
Vibration	Textile manufacturing	F	3times more likely to develop hyperpolymenorrhea and severe dysmenorrhea
Vibration, disruption of circadian rhythms, altitude changes and solar radiation	Airline stewardesses	F	Menstrual disorders. It reverses to pre-flight status with longer jet flight experience

RH hazard	Workplace/ process	M/F	Potential health effect
1,1,1-trichloromethane, toluene, xylene	Motor vehicle mechanics, shoe making	M	Spontaneous abortion and congenital malformations
1-2 Dibromo 3chloro Propane (DBCP)	Pesticide manufacturing plant	M	Epichlorinehydrin Carbaryl Azospermia and Oligospermia reduced sperm count and infertility, testicular toxicity, and reduction in sperm motility
2bromopropane	Electronic industry	M	Gonadotoxicity, Azoospermia, Oligospermia, poor sperm motility
Aluminum	Pot room workers, aluminum production plant	M	Progressive neurological disorders
Anesthetics	Dentists, physicians, women working in operating rooms.	M	Congenital abnormalities in offspring of exposed men. Spontaneous abortion among the wives
Carbon monoxide, polycyclic aromatic hydrocarbons	Fire fighters	M	Child heart defects
Chlorodecone (kepone)	Production workers	M	Oligospermia, and reduced sperm motility
Dioxin (TCDD)	Veterans	M	Significant excess of birth defects and Fetal loss among their parents. Lower mean sperm concentration
EDB short term exposure	Timber fumigators	M	Decreased sperm velocity, decrease sperm count, viability and motility and morphologic abnormalities
EDB, ethylenedibromide	Pesticides and leaded gasoline, farmers	M	Male reproduction, cancer, decrease in sperm count
Glycol Ethers (ethylene Glycol Ethers)	Ship yard painter	M	Lower sperm count, Azoospermia, and Oligospermia
Glycol ethers, 2-methoxyethanol, 2-ethoxyethanol	Metal casting painters	M	Testicular atrophy, degeneration of seminiferous tubules, severe Oligospermia abnormal sperm morphology, and reduced sperm motility and decreased sperm count.
Haloginated hydrocarbons	Oil, chemical and atomic workers	M	Elevation of the infant mortality rate among offspring
Heavy metals, persistent pesticides, chlorinated hydrocarbons and other organic compounds	Petro-chemical waste, water treatment plants	M	Fetal loss, mean sperm count decrease, and morphological changes
Hexavalent chromium found in Stainless steal, exposure to radiant heat	Stainless steel welders, mild steel welders	M	Spontaneous abortion in spouses
High temperature	Ceramic industry	M	Childlessness, difficulty in conceiving
Lead	Lead battery	M	Lead in blood, urine and semen associated with a decrease in sperm count that is not associated with a change in gonadotropins, prolactin or testosterone, abnormal sperm morphology, impaired spermatogenesis, azoospermia, Oligospermia, Teratospermia

Lead	Manufacturing batteries, production of alloys, gasoline stations, painting (red-lead), lead smelting and refining, ship painting	M	Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumor (childhood cancer of kidney)
Lead aerosols & microwave radiation	Artillery men &radar equipment operator in US military	M	Fertility problems, low sperm concentration
Lead toxicity	Lead working community	M	High rates of infertility, still birth, spontaneous abortion, neonatal death, macrocephaly, and convulsions
Manganese, inorganic mercury, Chlorodecone (Kepone)		M	Oligospermia, sexual dysfunction
Nitrous oxide, mercury		M	Reduce fertility
Organophosphate pesticides: methamidophos and ethyl parathion	Pesticide factory workers	M	Increase sperm aneuploidy
Perchloroethylene	Dry cleaning	M	Significant dose related changes in sperm shape and lateral head displacement: affecting semen quality
Radiant heat	Stainless steel and mild steel welding	M	Decrease sperm with normal morphology
Radiation exposure	Nuclear plant	M	Germ cell mutation, offspring can have leukemia and non- Hodgkin's lymphoma
Rubber chemical solvents e.g. Ethylene oxide	Oil refineries	M	Spontaneous abortion
Trichloroethylene	Metal workers	M	Somatic cell mutations and spermatotoxic effects
Vibration	Taxi drivers	M	Abnormal morphology of sperm, risk to sperm quality
Vinyl chloride	PVC polymerization workers, rubber workers	M	Fetal loss by wives

RH hazard	Workplace/ process	M/F	Potential health effect
Anesthetic gases	Operating room personnel	M/F	Congenital anomalies, lower birth weights and spontaneous abortion
Anti-neoplastics	Nurses, pharmacists, physicians, house keepers, laundry workers, and those who transport patients	M/F	Urinary mutagens, affect gonadal function (in both sexes) zoospermia and ovarian failure, chromosome anomalies, menstrual dysfunction, malformation and Fetal loss, inability to have children
Cadmium		M/F	Prostate cancer, female infertility
Carbon disulfide	Cellophane production manufacture of carbon tetrachloride, manufacture of neoprene and rubber accelerators and solvents for sulfur, iodine, bromine, phosphorus, selenium, in paints varnishes, paints and varnish removers and rocket fuel	M/F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
Hydrazine	Pharmaceutical workers	M/F	
Hydrocarbons	Petroleum &chemical industries	M/F	Leukemia in children
Lead	Automobile radiator repair, scrap metal smelting, pewter and leaded pane manufacturing, manufacturing polyvinyl chloride based plastics, cable and wire manufacturing, splicing of cable production with leaded based solder, firearms, instructors making lead glazed pottery and crystal glass	M/F	Failure of blastocyte implantation changes in morphology and implementation in young fetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and peritubular fibrosis, decreased function of prostate and seminal vesicles
Mercury **Organic solvents**	Carpenters, furniture industry	M/F M/F	Growth retardation, reduce fertility Spontaneous abortion, still births

Note: Refer to summary list of reported male and female R.H. outcomes on page 39 and glossary of medical terms on page 40 with regard to definition and understanding of the potential health effects mentioned in the Table 1.

Reported Male's R.H Outcomes

Abortion/ miscarriage
Azoospermia
Birth defect
Cancer
Change in gonadotropin, prolactin, testosterone
Childhood cancer of kidney
Childlessness
Congenital malformation
Convulsions
Decrease in conversion of ^{14}C lactate to carbon dioxide in male germ cells
Decreased libido, Low interest in sexual activity
Degeneration of seminiferous tubules
Difficulty in conceiving
Erectile dysfunction
Fetal loss (still birth)
Germ cell mutations
Ganado-toxicity
Impaired spermatogenesis
Infertility
Lead in blood urine, semen
Leukaemia in children
Macrocephaly
Male reproduction
Mutation in sperm reproduction
Neonatal death
Neurological disorders
Oligospermia
Prostate cancer/ decrease function
Semen quality
Sexual dysfunction
Somatic cell mutations
Sperm aneuploidy
Sperm count
Sperm morphology
Sperm motility
Sperm velocity
Sperm quality
Sperm shape lateral head displacement
Spermato-toxic effect
Teratospermia
Testicular atrophy
Testicular toxicity
Testis vulnerable

Reported Female's R.H Outcomes

Abnormal bleeding
Abortion / miscarriage
Affect developing embryo
Amenorrhoea
Birth defects
Childhood cancer
Difficulty in reproduction
Dysmenorrhoea
Eclampsia
Fetal loss
Growth retardation
Heart and oral cleft defects
Hyperglycaemia
Hyperpoly-menorrhea
Inter-menstrual bleeding
Low birth weight
Menorrhagia
Menstrual disorders
Neuro-toxicity in fetus Cycle length
Ovarian failure
Painful menstruation
Pregnancy induced hypertension
Pre-mature delivery
Pre menstrual syndrome
Reduced Fecundability
Risks of central nervous system
Small for gestational age children

Glossary for the Medical Terms used in the above table

1. Amenorrhea[1] :	Absence of menstrual flow.
2. Azoospermia[1]:	Absence of spermatozoa, no sperms in ejaculation
3. Blastocyst Implantation[1]	Implantation of a hollow sphere of cells that forms in very early fetal development.
4. Convulsions[1]:	An involuntary contraction or series of contractions of the voluntary muscles, Seizure.
5. Congenital Anomalies[1]:	Birth defects (a disease affecting someone since his birth, unfair or unsatisfactory process).
6. Dysmenorrhea[1]:	Painful menstruation.
7. Eclampsia[1]:	Severe pregnancy-induced hypertension after the point at which a woman has convulsed.
8. Fecundity Impairments[2]:	Involve the physiologic capacity to conceive. A woman is considered sub- fecund if she has difficulty getting pregnant or sustaining a pregnancy over a specified period.
9. Fertility :	The ability to deliver a viable child
10. Hyperpolymenorrhea[1]:	Increase in menstrual flow frequency and quantity.
11. Hyperglycemia[1]:	A great than normal amount of glucose in the blood.
12. In-fecundity[2]:	The inability to conceive or to impregnate. In medical literature the term in-fecundity often is synonymous with infertility.
13. Low Birth Weight[2]:	Less than 2500g, and very low birth weight less than 1500g.
14. Macrocephaly[1]:	Excessive size of the head.
15. Menorrhagia[1]:	An excessively profuse menstrual flow.
16. (Early) Neonatal Death[2]:	Death of a live-born infant at <7 days (168 hours).
17. (Late) Neonatal Death[2]:	Death between 7 days and 28 days.
18. Oligomenorrhea [2]:	Infrequent menstrual periods, the interval between periods being 40 to 45 days.
19. Oligospermia[1]:	A sperm count less than normal, low concentration of sperms.
20. Peritubular Fibrosis[1]:	Fibrosis around tubule.
21. Pregnancy wastage[1]:	The failure to carry a pregnancy to term, including both spontaneous abortion at any stage of pregnancy and stillbirth
22. Pre-menstrual Syndrome[1]:	A cluster of symptoms such as irritability and headache experienced prior to menstrual flows.
23. Preterm delivery[2]:	Delivery before 37 completed weeks, less than 259 completed days from the first of the LMP.
24. Resorption[1]:	Re-absorption; the lyses and assimilation of a substance as of bone.
25. Seminiferous Tubules[1]:	Tubule producing or carrying semen.
26. Sperm Aneuploidy[1]:	Sperm deviation from an exact multiple of the haploid number of chromosomes, whether fewer or more.
27. Spermatogenesis[1]:	The formation and maturation of spermatozoa.
28. Sperm count[1]:	The number of sperm present in one ejaculation.
29. Sperm motility[1]:	The documented movement of sperm after ejaculation.
30. Spontaneous abortion:	The loss of a pregnancy before viability of the fetus (20-24 weeks of gestation) 1,<500g or 20-22 weeks or 25cm length[2].
31. Stillbirth[2]:	>500 g (>1000 g international) nonviable.
32. Testicular Atrophy[1]:	Testicles become weak.
33. Zoospermia1:	Spermatozoa

[1] Maternal & Child Health Nursing: Care of the Childbearing and Childbearing Family, Adele Pillitteri, Second Edition, J.B. Lippincott Company, Philadelphia

[2] Lemsters, G.K. Occupational Exposure and Effect on Male and Female Reproduction, In: Environmental and Occupational Medicine, Rom, W.N. (ed.), Third Edition, Little Brown and Company, U.S.A., 1992, pp.: 147-170.

Table 2

Distribution Of Industries/ Occupations With Reproductive Health Hazards As Found In The Literature Review Carried Out Especially For This Study Showing The Number Of Such Industrial Units Or Occupations Present In Lebanon, And The Number Of Workforce (And Employees) Found In Such Industries/Occupations Classified According to Gender.

ISCO [3]	Leb. code[4]	Industry/ Occupation	Present in Lebanon	Present in Lebanon		Gender	
				Workforce[5]	Employees[6]	Male	Female
		Manufacturing Industry					
7215	724	Cable and wire manufacturing, splicing of cable production with leaded based solder	Manufacture of insulated wire and cable	528	526		
7124	742.828	Carpenters	Products of wood	6.933	3.490	6.799	154
8131, 8139	813,732	Ceramic industry	Non metallic mineral products[7]	322	176		
8159, 8229	822,311, 815	Chemical industry	Chemical products & man made fibers (including ink making)	2.797	2.310	2.122	675
7242/43, 8282/83	828,724	Electronic industry Electrical	machinery and apparatus	1.589	1.360	1.460	129
8222	822	Explosive manufactory	Manufacture of weapons and ammunition[8]	159	107		
8285	742.828	Furniture industry	Furniture[9]	9.640	6.552		
		Ink making	Manufacture of paints & printing ink	999	850		
7321	732	Instructors making lead glazed pottery and crystal glass	Manufacture of yarn of glass fibers & glass products	1044	865		

[3]ISCO: Four digit International Standard Classification of Occupations, ISCO-88 (Geneva: International Labour Office)
[4] Leb. code: Lebanese coding for occupations prepared by the Ministry of Social Affairs and the United Nations Population Fund.
[5]Workforce means: owners, family members and employees excluding seasonal workers
[6] Employees include permanent workers
[7] The Lebanese definition for ceramic industry means non metallic mineral products includes: a) Manufacture of non-structural non-refractory ceramic ware, b) Manufacture of refractory ceramic products, c) Manufacture of structural non-refractory clay and ceramic products.
[8] The Lebanese definition for explosive manufacturing includes: Manufacture of weapons and ammunition.
[9] The Lebanese definition for furniture industry includes: a) Manufacture of wood furniture and fixtures, b) Manufacture of plastic furniture, c)Manufacture of furniture from reeds, d) Strewing, e) Wood carving, e) Other furniture manufacturing from plastic, leather and glass, f) Manufacture of stuffing.

8264		Laundry workers, Dry cleaning workers	N.I.F.[10]				
		Lead battery	N.I.F.[10]				
		Lead working community	N.I.F.[10]				
		Lead smelting and refining	N.I.F.[10]				
7435, 8269	744	Leather work	Leather and leather products (footwear not included)	1.402	803		
8222	822	Manufacturing firearms	Manufacture of weapons and ammunition				
		Manufacturing batteries	Manufacture of accumulators, primary cells, & batteries	32	26		
8284	722	Metal workers	Metal products	14.492	9.342	13.988	504
7141	714	Painting (red-lead)	N.I.F.				
	714	Paints and varnish removers	N.I.F.				
		Pesticide factory workers	Manufacture of fertilizers and nitrogen compounds	42	37		
8155	815	Petrol workers, Refinery workers, Oil workers Petroleum industry	Coke and refined petroleum products	311	281	282	29
7321	732	Pottery workers	Pottery workers	132			
	721	Production of alloys	N.I.F.				
8231, 8232	823	Rubber workers, workers who processed or polymerized plastics made up of vinyl chloride or styrene, manufacturing polyvinyl chloride based plastics, PVC polymerization workers,	Rubber and Plastic products	2.776	2.069	2.418	359
7442	744	Shoe making	Manufacture of footwear	5.079	3.408		
8286,7432/35/36	743, 826, 828	Textile manufacturing	Textile	3.670	2.206	2.591	1.079
			Total for Industrial Sector	**51.947**	**34.408**		
		Agricultural Sector					
6111/12/13/14	321, 611, 921	Agricultural workers	Agricultural workers and farmers	194.829		180.479	13.785
	321,612	Animal care workers	Animal care workers	22.589			
2223, 3227	222, 322	Veterinarians	Veterinarians	104		94	10
			Total of Agricultural Sector	**217.522**			

[10] N.I.F. no information was found concerning number and distribution of such industries or occupations.

		Health sector					
2229	222	Anesthesiologists	N.I.F.				
2221	221	Biology	N.I.F				
3225	322	Chair-side dental assistants	Dental assistants				
2222	222	Dental personnel	Dentists				
2229	322.223	Health care workers	N.I.F				
2229	321	Laboratory workers	N.I.F				
2230.3231	323.223	Nurses	Nurses	3,600			
2229	222	Operating room personnel	N.I.F				
3228	822	Pharmaceutical workers	N.I.F				
2224	222.322	Pharmacists	Pharmacists	2,605			
2221	222	Physicians	Physicians	8,943			
2229	322	Those who transport patients	N.I.F				
5131	322.513	Workers in contact with infants and children	N.I.F				
			Total: of Health Sector	**15,148**			
		Miscellaneous					
3143	511	Airline stewardesses	Airline Hostesses	496[11]		191	278
		Atomic workers	N.E.[12]				
7141/42		Bridge re-painters	N. E.				
		Cellophane production	N. E.				
		Embalming	N.I.F.				
		Estrogen plant workers	N. E.				
5161	516	Fire fighters	Civil Defense[13]	1600			
		Gasoline stations and leaded gasoline	Gasoline stations workers in Lebanon[14]	9,000			
5141	514	Hairdressers	Hairdresser	2,000*			
3471		Home re-modelers	N.I.F.				
5121	512	House keepers	N.I.F.				
8159		Manufacture of carbon tetrachloride	N.E.				
		Manufacture of neoprene and rubber accelerators and solvents for sulfur, iodine, bromine, phosphorus, selenium, in paints varnishes	N.I.F.				
7141/42	721,722, 812	Metal casting painters	N.I.F.				
		Nuclear plant	N.E.				
		Pewter and leaded pane	N.I.F.				
N.I.F.[8]		Petro-chemical waste	N.I.F.				
N.I.F.[8]		Pot room workers	N.I.F.				
		Production workers	N.I.F.				

[11] Airline stewardesses include 162 females, 153 males, add to them 77 butterflies who are all females, and 77 seniors who are divided into half males and half females

[12] N.E.: Up to the researchers' knowledge, these occupations do not exist in Lebanon.

[13] There is 1000 persons employed in the civil defence in Lebanon and 1600 volunteers

[14] The President of the Syndicate of the Owners of Gas Stations, Mr. Nabil Brax, announced in an interview with him on the Lebanese Broadcasting Corporation News at 7:50p.m. date 12-Apr.-2001 that there is an estimate of 1200 legal stations and 1800 operating illegally in Lebanon, with an average of 3 workers per station.

7231	723	Radiator repairers, Automobile radiator repair, Motor vehicle mechanics	N.I.F.				
		Rocket fuel	N.E.				
	721	Scrap metal smelting	N.I.F.				
	812	Smelter	N.I.F.				
7141/42		Ship painting	N.E.				
	721,812	Solderers	N.I.F.				
7212	721,812	Stainless steel welders	N.I.F.				
8322	832	Taxi drivers	Taxi Drivers [15]	45.000		45000	
7421		Timber fumigators	N.I.F.				
0110		US navy women	N.E.				
		Viscose rayon workers	N.E.				
8163	816	Water treatment plants	N.I.F.				
7212	721,812	Welders	Treatment & coating of metals	1.007	438		
			Total of Miscellaneous	**59.076**			
			Total Workforce at a Potential Risk	**343,693**			

An estimate of the total number of workforce that is potentially at risk is: 343.693 workers

- ❒ Small sized enterprises employ 5-10 workers, whereas medium sized enterprises employ between 10-20 workers
- ❒ SMEs in Lebanon, usually owners are a part of the working force and they take part in the work process. Therefore, we will consider the workforce as (employer & employee) target population.

[15] The 45000 taxi drivers include: 33500 drivers of taxi cars, 2000 drivers of big buses, 4000 drivers of small buses, 4000 drivers of public transportation, 1500 drivers of six wheel trucks.

* According to a phone call with Mr. Marcel Tabib, the Honorary President of the Syndicate of Owners of Hairdressing Shops. There are 2000 owners of hairdressing shops, out of which 900 are legally registered in the syndicate, and only 2 or 3% are female owners.

References:

- Industrial Report, Statistics and Findings, Ministry of Industry and German Technical Co-operation, 1998-1999

- Tabara, R., Lebanon 2000, The Health Sector in Lebanon 2000, Center for Development Studies and Projects MADMA, Middle East Research and Studies, First Edition, Beirut 2000, 35-40.

- Letters and personal phone calls with the following syndicates: Syndicate of Taxi Owners and Taxi Drivers in Beirut, Syndicate of Veterinarian Doctors in Beirut, Syndicate of Owners of Gas Stations, Syndicate of Dentists, Middle East Air-lines

- Guide to the Artisans Workers in Lebanon 2000, Lebanese Republic, Ministry of Social Affairs, pp: 2-3, and 38-41 (Published in Arabic Language)

Table 3

Tables For Risk Hierarchy Of Occupational Hazards As Evaluated In Relation To:

3.a.	Chemical vs. Reproductive Health Outcomes
3.b.	Chemical vs. Gender
3.c.	Chemical vs. Route of Entry
3.d.	Chemical vs. Target Organs
3.e.	Chemical vs. Carcinogenicity Potential
3.f.	Chemical vs. Lethal Dose 50
3.g.	Chemical vs. Occupational Exposure Standards
3.h.	Risk Hierarchy of Chemicals in Relation to All Risk Factors
3.i.	Risk Hierarchy of Industries in Relation to All Occupational Hazards (Chemicals) Present in Their Premises

References:

These references were used for constructing all the 9 Risk Hierarchy Tables:

- NIOSH, Pocket Guide to Chemical Hazards, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, June 1997.

- 2000 TLVs and BEIs, Threshold limit values for chemical substances and physical agents and biological exposure indices, ACGIH, 2000.

- EH40/95 Occupational exposure limits, Health and Safety Executive, 1995.

- World Health Organization, International Labor Organization, United Nations Environment Program, IPCS INTOX International Program on Chemical Safety [CD-ROM], 2000.

3.a. Chemical vs. Reproductive Health Outcomes

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to the number reproductive health outcomes exposure to such hazards might cause.

Chemical	# RH•	Points
Lead	25	5
2-Ethoxyethanol	9	5
2-Methoxyethanol (2ME)	9	5
Glycol ethers	7	4
Carbaryl	6	3
1-2Dibromo 3chloro Propane	6	3
Epichlorinehydrin (epichlorohydrin)	6	3
Perchloroethylene (tetrachloroethylene)	6	3
Carbon disulfide	5	3
Ethylenedibromide	5	3
2bromopropane	4	2
Nickel	4	2
Toluene	4	2
Xylene	4	2
Chlorinated hydrocarbons	3	2
Styrene	3	2
Vinyl chloride	3	2
Arsine gas	2	1
Boric acid	2	1
Cadmium	2	1
Ethylene glycol	2	1
High temperature	2	1
Hydrocarbons	2	1
Ionizing radiation	2	1
Isopropyl Alcohol	2	1
(Chlorodecone) Kepone	2	1
Manganese	2	1
Mercury	2	1
Organic solvents	2	1
Phenols	2	1
Radio frequency	2	1
Thallium	2	1
Trichloroethane	2	1
Trichloroethylene	2	1
1,1,1-trichloromethane (chloroform)	2	1
Aluminum	1	1
Aromatic Amines	1	1
Benzene	1	1
Carbon Monoxide	1	1
Chlorophenoles	1	1
Ethyl parathion	1	1
Formaldehyde	1	1
Haloginated hydrocarbons	1	1
Hexavalent Chromium	1	1
Methamidophos	1	1
Nitrous oxide	1	1
Organophosphate pesticides	1	1
Polyciclic aromatic hydrocarbons	1	1
Rubber chemical solvents like ethylene oxide	1	1
Trinitrotoluene (TNT)	1	1

• # RH: Number of reproductive health outcomes reported to be associated with exposure to such chemicals.
Refer to Table1 in Appendix I to see the types of reproductive health outcomes caused by each chemical.
Ranking is done as follows:

A hazard causing	> 9 RH	→ 5 points
	7 RH	→ 4 points
	5/6 RH	→ 3 points
	3/4 RH	→ 2 points
	<2 RH	→ 1 point

3.b. Chemical vs. Gender

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to Gender, meaning whether it affects males, females or both genders at the same time.

Chemical	Gender	Points
Cadmium	M*&F•	4
Carbon disulfide	M&F	4
2-Ethoxyethanol (2EE)	M&F	4
Hydrocarbons	M&F	4
Lead	M&F	4
Mercury	M&F	4
2-Methoxyethanol (2ME)	M&F	4
Organic solvents	M&F	4
Perchloroethylene (tetrachloroethylene)	M&F	4
Rubber chemical solvents like ethylene oxide	M&F	4
Styrene	M&F	4
Toluene	M&F	4
Vinyl chloride	M&F	4
Xylene	M&F	4
Aromatic Amines	F	1
Arsine gas	F	1
Benzene	F	1
Boric acid	F	1
Chlorophenoles	F	1
Ethylene glycol	F	1
Formaldehyde	F	1
Ionizing radiation	F	1
Isopropyl Alcohol	F	1
Nickel	F	1
Phenols	F	1
Radio frequency	F	1
Thallium	F	1
Trichloroethane	F	1
Trinitrotoluene (TNT)	F	1
Aluminum	M	1
2bromopropane	M	1
Carbaryl	M	1
Carbon Monoxide	M	1
Chlorinated hydrocarbons	M	1
1-2Dibromo 3chloro Propane	M	1
Epichlorinehydrin (epichlorohydrin)	M	1
Ethylenedibromide	M	1
Ethyl parathion	M	1
Glycol ethers	M	1
Haloginated hydrocarbons	M	1
Hexavalent Chromium	M	1
High temperature	M	1
(Chlorodecone) Kepone	M	1
Manganese	M	1
Methamidophos	M	1
Nitrous oxide	M	1
Organophosphate pesticides	M	1
Polyciclic aromatic hydrocarbons	M	1
Trichloroethylene	M	1
1,1,1-trichloromethane (chloroform)	M	1

* M: Affecting male reproductive system.
• F: Affecting female reproductive system.

Ranking was done as follows:
A hazard affecting:
Both males and females → 4 points
Either males or females → 1 point

3.c. Chemical vs. Route of Entry

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to routes through which such hazards enter into the body.

Chemical	Route of Entry	Points
Benzene	abs, con, ing, inh	4
Boric acid	abs, con, ing, inh	4
Carbaryl	abs, con, ing, inh	4
Carbon disulfide	abs, con, ing, inh	4
1-2Dibromo 3chloro Propane	abs, con, ing, inh	4
Epichlorinehydrin (epichlorohydrin)	abs, con, ing, inh	4
2-ethoxyethanol (2EE)	abs, con, ing, inh	4
Ethylenedibromide	abs, con, ing, inh	4
(Chlorodecone) Kepone	abs, con, ing, inh	4
Mercury	abs, con, ing, inh	4
Perchloroethylene (tetrachloroethylene)	abs, con, ing, inh	4
Phenols	abs, con, ing, inh	4
Styrene	abs, con, ing, inh	4
Thallium	abs, con, ing, inh	4
Toluene	abs, con, ing, inh	4
Trichloroethane	abs, con, ing, inh	4
Trichloroethylene	abs, con, ing, inh	4
1,1,1-trichloromethane (chloroform)	abs, con, ing, inh	4
Trinitrotoluene (TNT)	abs, con, ing, inh	4
Xylene	abs, con, ing, inh	4
Aluminum	con, ing, inh	3
2 bromopropane	con, ing, inh	3
Ethyl parathion	con, ing, inh	3
Glycol ether (ethylene glycol)	con, ing, inh	3
Isopropyl Alcohol	con, ing, inh	3
Lead	con, ing, inh	3
Methamidophos	ing, inh, sk	3
2-Methoxyethanol (2ME)	con, ing, inh	3
Nickel	con, ing, inh	3
Nitrous oxide	abs, con, inh	3
Organophosphate pesticides	ing, inh, sk	3
Polyciclic aromatic hydrocarbons	con, ing, inh	3
Rubber chemical solvents like ethylene oxide	con, ing (liq), inh	3
Arsine gas	con (liq), inh	2
Cadmium	ing, inh	2
Carbon Monoxide	con (liq), inh	2
Formaldehyde	con, inh	2
Hexavalent Chromium	con, inh	2
Manganese	ing, inh	2
Vinyl chloride	con (liq), inh	2
Aromatic Amines[0]	***	***
Chlorinated hydrocarbons[0]	***	***
Chlorophenoles[0]	***	***
Haloginated hydrocarbons[0]	***	***
Organic solvents[0]	***	***
High temperature	Physical hazard	***
Ionizing radiation	Physical hazard	***
Radio frequency	Physical hazard	***

Inh: Inhalation **Abs: Skin Absorption** **Ing: Ingestion** **Liq: Liquid**
Con: Eye Or Skin/Dermal Contact **Sk: Skin Absorption**

Ranking was done as follows: each route of entry gives the hazard one point
A hazard that has: 4 Routes of Entry ⟶ 4 points 3 Routes of Entry ⟶ 3 points
2 Routes of Entry ⟶ 2 points

Note: Physical hazards were not targeted in this study and they do not have a route of entry, with the perspective used for chemicals.

[0] These are groups of different chemicals, and each member of this group has its own characteristics that vary from one chemical to the other

3.d. Chemical vs. Target Organs

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to number of organs that such chemicals affect in the body. Chemical vs. Carcinogenicity Potential.

Chemical	Target organs	No.	Points
1-2Dibromo 3chloro Propane	Eyes, Skin, RS, CNS, Liver, Kidney, Spleen, Digestive Sys	8	5
Nitrous oxide	Skin, Eye, PNS, Liver, Kidney, Blood, CNS, RS	8	5
Xylene	Eyes, Skin, RS, Kidneys, Liver, CNS, GI, Blood	8	5
Trinitrotoluene (TNT)	Eyes, Skin, RS, Kidneys, Liver, CNS, CVS, Blood	8	5
Carbon disulfide	CNS, CVS, PNS, Eyes, Kidneys, Liver, Skin	7	5
(Chlorodecone) Kepone	Eyes, Skin, RS, CNS, Liver, Kidney, Bone Marrow	7	5
Rubber chemical solvents like ethylene oxide	Eyes, Skin, RS, Liver, Kidney, CNS, Blood	7	5
Thallium	Eyes, RS, Liver, CNS, Kidneys, GI, Body Hair	7	5
Benzene	Eyes, Skin, Resp Sys, Blood, CNS, Bone Marrow	6	3
2-ethoxyethanol (2EE)	Eyes, RS, Blood, Liver, Kidneys, Hemato Sys	6	3
Glycol ether	Eyes, Skin, RS, CNS, Liver, Kidney	6	3
Lead	Eyes, GI, Kidney, CNS, Blood, Gingival Tissues	6	3
Perchloroethylene (tetrachloroethylene)	Eyes, Skin, RS, Liver, Kidney, CNS	6	3
Polyciclic aromatic hydrocarbons	Skin, Lungs, Liver, Kidney, Blood, Lymph Sys	6	3
Toluene	Eyes, Skin, RS, Kidneys, Liver, CNS	6	3
Trichloroethylene	Eyes, Skin, RS, Heart, Liver, CNS	6	3
1,1,1-trichloromethane (chloroform)	Liver, Kidney, Heart, Eyes, Skin, CNS	6	3
Boric acid	RS, Eye, Skin, Brain, Kidneys	5	3
2bromopropane	RS, CNS, GI, Skin, Eye	5	3
Carbaryl	RS, CNS, CVS, Skin, Blood	5	3
Epichlorinehydrin (epichlorohydrin)	Eyes, Skin, RS, Liver, Kidney	5	3
Ethylenedibromide	Eyes, Skin, RS, Liver, Kidney	5	3
Mercury	Eyes, Skin, RS, CNS, Kidneys	5	3
Phenols	Eyes, Skin, RS, Liver, Kidney	5	3
Styrene	Eyes, Skin, RS, Liver, CNS	5	3
Trichloroethane	Eyes, RS, CNS, Liver, Kidney	5	3
Vinyl chloride	Liver, CNS, Blood, RS, Lymphatic Sys	5	3
Aluminum	Lung, Brain, Neuro Sys, RS	4	3
Cadmium	RS, Kidneys, Prostate, Blood	4	3
Carbon Monoxide	CVS, Lungs, Blood, CNS	4	3
Ethyl parathion	Nervous Sys, RS, Cardiovascular Sys, Eye	4	3
Isopropyl Alcohol	Eyes, Skin, RS, CNS	4	3
Manganese	RS, CNS, Blood, Kidneys	4	3
Methamidophos	Nervous Sys, RS, Cardiovascular Sys, Eye	4	3
2-Methoxyethanol (2ME)	CNS, Blood, Immune Sys, Bone Marrow	4	3
Organophosphate pesticides	Nervous Sys, RS, Cardiovascular Sys, Eye	4	3
Arsine gas	Blood, Kidneys, Liver	3	1
Nickel	Nasal Cavities, Lungs, Skin	3	1
Formaldehyde	Eyes, RS	2	1
Hexavalent Chromium	Skin, RS	2	1
Aromatic Amines[0]			
Chlorinated hydrocarbons∞			
Chlorophenoles[0]			
Haloginated hydrocarbons[0]			
Organic solvents[0]			
High temperature	Physical Hazards		
Ionizing radiation	Physical Hazards		
Radio frequency	Physical Hazards		

No.: How many target organs the chemical affect
CNS: Central Nervous system
GI: Gastro-intestinal tract
PNS: Peripheral Nervous system
RS: Respiratory system
CVS: Cardio-vascular system

Ranking was done as follows:
A hazard that affects: >7 organs → 5 points 4-6 organ → 3 points
<3 organs → 1 point

[0] These are groups of different chemicals, and each member of this group has its own characteristics that vary from one chemical to the other.

3.e. Chemical vs. Carcinogenicity Potential

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to whether such hazards are carcinogenic or not.

Chemical	Carcinogenicity	Points
Arsine gas	Lung and lymphatic cancer	5
Cadmium	Prostatic and lung cancer	5
1-2Dibromo 3chloro Propane	In animals cancer of nasal cavity, tongue, pharynx, lungs, stomach, adrenal & mammary gland	5
Ethylenedibromide	In animals skin and lung tumors	5
Nickel	Lung and nasal cancer	5
Organophosphate pesticides	Tumors in rats and mice	5
Polyciclic aromatic hydrocarbons	Skin, lung, & scrotal cancer	5
Rubber chemical solvents like ethylene oxide	Peritoneal cancer, leukemia	5
Styrene	Leukemia, and Lymphoma	5
Trichloroethylene	In animals liver & kidney cancer	5
1,1,1-trichloromethane (chloroform)	Liver & kidney cancer	3
Benzene	Leukemia	3
Epichlorinehydrin (epichlorohydrin)	In animals nasal cancer	3
Formaldehyde	Nasal cancer[0]	3
Hexavalent Chromium	Lung cancer[0]	3
Isopropyl Alcohol	Nasal sinus Cancer[0]	3
(Chlorodecone) Kepone	Liver cancer in animals	3
Nitrous oxide	Cancer of cervix in female	3
Perchloroethylene (tetrachloroethylene)	In animals: liver tumors	3
Trichloroethane	In animals: liver cancer	3
Vinyl chloride	Liver cancer	1
Aluminum	NM*	1
Boric acid	NM	1
2bromopropane	NM	1
Carbaryl	NM	1
Carbon disulfide	NM	1
Carbon Monoxide	NM	1
2-ethoxyethanol (2EE)	NM	1
Ethyl parathion	NM	1
Glycol ether	NM	1
Lead	NM	1
Manganese	NM	1
Mercury	NM	1
Methamidophos	NM	1
2-Methoxyethanol (2ME)	NM	1
Phenols	NM	1
Thallium	NM	1
Toluene	NM	1
Trinitrotoluene (TNT)	NM	1
Xylene	NM	1
Aromatic Amines∞	--------	--------
Chlorinated hydrocarbons∞	--------	--------
Chlorophenoles∞	--------	--------
Haloginated hydrocarbons∞	--------	--------
Organic solvents∞	--------	--------
High temperature	Physical Hazards	--------
Ionizing radiation	Physical Hazards	--------
Radio frequency	Physical Hazards	--------

Ranking was done as follows: A hazard that affects: >1 type of cancer → 5 points,
1 type of cancer → 3 points,
NM → 1 point

Note: Physical hazards where not targeted in this study.

• A chemical is considered Carcinogenic if it causes any type of cancer in humans or in any other species.
[0] Reference: Nicholson, W.J., Quantitative Risk Assessment for Carcinogens, In: Environmental and Occupational Medicine, Rom, W.,N., Second Edition, Little Brown and Company, U.S.A., 1992, pp: 1378-1379.
* NM: not mentioned in references if this chemical is carcinogenic or not, thus it was considered as non- carcinogenic.
∞ These are groups of different chemicals, and each member of this group has its own characteristics that vary from one chemical to the other.

3.f. Chemical vs. Lethal Dose 50

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to the dose that is lethal to 50% of the population exposed to such hazard (LD_{50})

Chemical	LD_{50} in mg/kg[x]	Points
Ethyl parathion	Oral rat 13mg/kg	4
(chlorodecone) Kepone	Oral rat 95mg/kg	4
Methamidophos	Oral rat 50mg/kg	4
Thallium	Oral rat 41.2mg/kg	4
Aluminum	Oral several 100s to 1000mg/kg	3
Benzene	Oral rat 930mg/kg	3
Carbaryl	Oral rat 500-600mg/kg	3
Carbon disulfide	Oral rat 456mg/kg[∞]	3
1-2Dibromo 3chloro Propane	Oral rat 170-300mg/kg[β]	3
Epichlorinehydrin (epichlorohydrin)	Oral rat 260mg/kg	3
Formaldehyde	Oral rat 500mg/kg[•]	3
Hexavalent Chromium	Oral rat 177mg/kg	3
Manganese	Oral rat 250-275mg/kg	3
Mercury	Oral rat 500mg/kg[*]	3
Phenols	Oral rat 340mg/kg	3
Rubber chemical solvents like ethylene oxide	Oral rat 330mg/kg	3
Vinyl chloride	Oral rat 500mg/kg	3
1,1,1-trichloromethane (chloroform)	Oral rat 908mg/kg	3
Boric acid	Oral rat 2660mg/kg	2
2-Ethoxyethanol (2EE)	Oral rat 2125mg/kg	2
Isopropyl Alcohol	Oral rat 4420-5840mg/kg	2
2-Methoxyethanol (2ME)	Oral rat 2460mg/kg/kg	2
Perchloroethylene (tetrachloroethylene)	Oral rat 2600mg/kg	2
Styrene	Oral rat 5000mg/kg	2
Toluene	Oral rat 2600-7500mg/kg	2

[∞] Cornell University, Carbon Disulfide Pesticide Tolerance - Final Rule 6/93, [Online]. Available: http://pmep.cce.cornell.edu/profiles/insect-mite/cadusafos-cyromazine/carbon-disulfide/carbon-disulfide-tol.html [2001, August6].
[β] Cornell University, 1,2-dibromo-3-chloropropane (DBCP), Chemical Profile 6/84, [Online]. Available: http://pmep.cce.cornell.edu/profiles/fumigant/dibromochloropropane/prof-dibromochloropropane.html [2001, August9].
[•] Acutely Toxic Substances, [Online]. Available: http://www.umdnj.edu/eohssweb/labsafety/a/popup/acutely.htm [2001, August3].
[*] Peters, B. Nordiska Dental AB, Safety Data Sheet, [Online]. Available: http://www.nordiskadental.se/psds/english/europdpu.pdf [2001, August7].

Chemical	LD_{50} in mg/kg[x]	Points
Trichloroethylene	Oral rat 2600mg/kg	2
Xylene	Oral rat 4300mg/kg	2
Nickel	Oral rat >9000mg/kg[Σ]	2
Trichloroethane	Oral rat between 12900mg/kg and 10300mg/kg	1
Arsine gas	NA[Z]	1
2bromopropane	NA	0
Cadmium	NA	0
Carbon Monoxide	NA	0
Ethylenedibromide	NA	0
Glycol ether	NA	0
Lead	NA	0
Nitrous oxide	NA	0
Trinitrotoluene (TNT)	NA	0
Aromatic Amines°	----------	0
Chlorinated hydrocarbons°	----------	----------
Chlorophenoles°	----------	----------
Haloginated hydrocarbons°	----------	----------
Organic solvents°	----------	----------
Organophosphate pesticides°	----------	----------
Polyciclic aromatic hydrocarbons°	----------	----------
High temperature	Physical Hazards	----------
Ionizing radiation	Physical Hazards	----------
Radio frequency	Physical Hazards	----------

[Σ] Westbrook Manufacturing, Material Safety Data Sheet, [Online]. Available: http://www.westbrookmfg.com/PDF%20MSDS/msdsa105.pdf [2001, August9].
° These are groups of different chemicals, and each member of this group has its own characteristics that vary from one chemical to the other, which means there is no specific LD_{50} value for mixture of chemicals.
[x] Other LD50 for other animals and other routes of entry were also found, but the authors used rats and oral route because these were the most frequently reported.
[z] NA means no LD50 values were found

Ranking was done by factor of ten, as follows:

LD_{50} in the range of:

10s mg/kg	→	4 points
100s mg/kg	→	3 points
1000s mg/kg	→	2 points
10,000s mg/kg	→	1 point
No LD_{50}	→	0 points

3.g. Chemical vs. Occupational Exposure Standards

Risk hierarchy of physical and chemical hazards having reproductive health effects that workers are exposed to in their occupational settings in relation to the Occupational Exposure Standards (OES) of such chemical hazards. Classification of OES was done in ppm units or in mg/m3 units.

OES in PPM

Chemical	OES in ppm	Points
Formaldehyde	0.016ppm	5
Ethylenedibromide	0.045ppm	5
Rubber chemical solvents like ethylene	<0.1ppm	4
Benzene	0.1ppm	4
2-ethoxyethanol (2EE)	0.5ppm	4
Epichlorinehydrin (epichlorohydrin)	0.5ppm	4
Carbon disulfide	1ppm	3
Vinyl chloride	1ppm	3
2-Methoxyethanol (2ME)	5ppm	3
Phenols	5ppm	3
1,1,1-trichloromethane (chloroform)	10ppm	2
Trichloroethane	10ppm	2
Nitrous oxide	25ppm	2
Perchloroethylene (tetrachloroethylene)	25ppm	2
Trichloroethylene	25ppm	2
Carbon Monoxide	35ppm	2
Ethylene glycol	50ppm	2
Glycol ether	50ppm	2
Styrene	50ppm	2
Toluene	100ppm	1
Xylene	100ppm	1
Isopropyl Alcohol	400ppm	1

OES in mg/m^3

Chemical	OES in mg/m^3	Points
(chlorodecone) Kepone	0.001mg/m3	5
Arsine gas	0.002mg/m3	5
Nickel	0.015mg/m3	4
Mercury	0.05mg/m3	4
Lead	0.100mg/m3	3
Thallium	0.1mg/m3	3
Ethyl parathion	0.1mg/m3	3
Trinitrotoluene (TNT)	0.5mg/m3	3
Hexavalent Chromium	0.5mg/m3	3
Cadmium	1.01mg/m3	2
Manganese	1mg/m3	2
Boric acid	1mg/m3	2
Aluminum	1mg/m3	2
Carbaryl	5mg/m3	2
1-2Dibromo 3chloro Propane	N.A[z]	0
Methamidophos	N.A[z]	0
2bromopropane	N.A[z]	0
Organophosphate pesticides°		
Organic solvents°		
Haloginated hydrocarbons°		
Chlorinated hydrocarbons°		
Polyciclic aromatic hydrocarbons°		
Aromatic Amines°		
Chlorophenoles°		
High temperature	Physical Hazards	
Radio frequency	Physical Hazards	
Ionizing radiation	Physical Hazards	

[z] NA means no OES values were found

Ranking was done by factor of ten, as follows:

OES in the range of:

0.001s mg/m3 → 5 points
0.01s mg/m3 → 4 points
0.1s mg/m3 → 3 points
1s mg/m3 → 2 points
10s mg/m3 → 1 point

OES in the range of:

0.01s ppm → 5 points
0. 1s ppm → 4 points
1s ppm → 3 points
10s ppm → 2 points
100s ppm → 1 point
No OES value → 0 points

° These are groups of different chemicals, and each member of this group has its own characteristics that vary from one chemical to the other, which means there is no specific OES value for mixture of chemicals

3.h. Risk Hierarchy of Chemicals in Relation to All Risk Factors

Adding up the points that each hazard got in the risk hierarchy tables: 3.a, 3.b, 3.c, 3.d, 3.e, and 3.f, in order to evaluate the level of toxicity of each hazard.

Chemical	a) #RH	b) Gender	c) Route	d) Organ	e) Cancer	f) LD50	g) OES	Result
Organic solvents (includes glycol ether, Toluene, Xylene, Styrene, and Benzene)								91*
Ethylene glycol ethers (2EE & 2ME)								44•
Rubber chemical solvents like ethylene oxide	1	4	3	5	5	3	4	25
Carbon disulfide	3	4	4	5	1	3	3	23
(Chlorodecone) Kepone	1	1	4	5	3	4	5	23
2-Ethoxyethanol (2EE)	5	4	4	3	1	2	4	23
Styrene	2	4	4	3	5	2	2	22
1-2Dibromo 3chloro Propane	3	1	4	5	5	3	0	21
Epichlorinehydrin (epichlorohydrin)	3	1	4	3	3	3	4	21
Ethylenedibromide	3	1	4	3	5	0	5	21
2-Methoxyethanol (2ME)	5	4	3	3	1	2	3	21
Perchloroethylene (tetrachloroethylene)	3	4	4	3	3	2	2	21
Mercury	1	4	4	3	1	3	4	20
Vinyl chloride	2	4	2	3	3	3	3	20
Benzene	1	1	4	3	3	3	4	19
Lead	5	4	3	3	1	0	3	19
Thallium	1	1	4	5	1	4	3	19
1,1,1-trichloromethane (chloroform)	1	1	4	3	5	3	2	19
Xylene	2	4	4	5	1	2	1	19
Trichloroethylene	1	1	4	3	5	2	2	18
Cadmium	1	4	2	3	5	0	2	17
Carbaryl	3	1	4	3	1	3	2	17
Nickel	2	1	3	1	5	1	4	17
Toluene	2	4	4	3	1	2	1	17
Ethyl parathion	1	1	3	3	1	4	3	16
Formaldehyde	1	1	2	1	3	3	5	16
Phenols	1	1	4	3	1	3	3	16
Arsine gas	1	1	2	1	5	0	5	15
Nitrous oxide	1	1	3	5	3	0	2	15
Trichloroethane	1	1	4	3	3	1	2	15
Trinitrotoluene (TNT)	1	1	4	5	1	0	3	15
Aluminum	1	1	3	3	1	3	2	14
Boric acid	1	1	4	3	1	2	2	14
Glycol ether (diethylene glycol)	4	1	3	3	1	0	2	14
Hexavalent Chromium	1	1	2	1	3	3	3	14
Isopropyl Alcohol	1	1	3	3	3	2	1	14
Manganese	1	1	2	3	1	3	2	14
Methamidophos	1	1	3	3	1	4	0	13
Organophosphate pesticides	1	1	3	3	5	*	*	13
Polycyclic aromatic hydrocarbons + hydrocarbons	1	1	3	3	5	*	*	13
2bromopropane	2	1	3	3	1	0	0	13
Carbon Monoxide	1	1	2	3	1	0	2	10
Chlorophenoles (tanning)	1	1						*
Haloginated hydrocarbons	1	1						*
Chlorinated hydrocarbons	2	1						*
Aromatic Amines	1	1						*
High temperature	Physical factors were not studied							
Radio frequency	Physical factors were not studied							
Ionizing radiation	Physical factors were not studied							
Vibration	Physical factors were not studied							
	Physical factors were not studied							

- * Values not available
- #RH: Number of associated reproductive health outcomes.
- Route: Route of entry through which the chemical penetrate into the body.
- Organ: Target organ that the chemical affect.
- Cancer: Chemical is carcinogenic or not.

* 121 is the total sum of the points of: glycol ether, toluene, xylene, benzene, and styrene since according to the literature these chemicals form the organic solvents group.
• 44 is the total sum of the points of: 2ethoxyethanol (2EE) and 2 methoxyethanol (2ME) since according to the literature these chemicals form the ethylene glycol ethers.

3.i. Risk Hierarchy of Industries in Relation to All Chemicals Found in them

Classifying the risk hierarchy of industries and occupations in relation to the hazards found in such occupations/ industries. The ranking of industries/occupations was done by adding up the total sum of the points of all the chemicals that are a hazard to reproductive health and found in such industries according to the literature review done especially for this research project.

HIGHRISK	Occupations	Hazard	Rank
	Semiconductor industry	Ethylene Glycol Ethers [2-Methoxyethanol (2ME), 2-Ethoxyethanol (2EE)], Xylene, Toluene, Trichloroethylene, Trichloroethane Phenols, Isopropyl Alcohol, Arsine Gas, Boric Acid, Thallium, Lead, Cadmium, Radio Frequency, Ionizing Radiation	227
	Pesticide factory workers	(EDB) Ethylenedibromide. 1-2 Dibromo 3chloro Propane (DBCP) Epichlorinehydrin Carbaryl. Organophosphate pesticides: methamidophos and ethyl parathion	122
	Carpenters	Organic solvents	121
	Furniture industry	Organic solvents	121
	Ink making	Formaldehyde, Aluminum, Isopropyl alcohol, toluene, Xylene	80
	Radiator repairers, Automobile radiator repair, Motor vehicle	Lead, 1,1,1-Trichloromethane, Toluene, Xylene	74
	mechanics Rubber workers, workers who processed or polymerized plastics made up of vinyl chloride or styrene, manufacturing polyvinyl chloride based	Venylchloride Or Styrene, lead	61
	plastics, PVC polymerization workers,	Glycol ethers, 2-Methoxyethanol, 2-Ethoxyethanol	58
	Metal casting painters Petrol workers, Refinery workers,	Hydrocarbons, Nickel. Haloginated Hydrocarbons. Rubber chemical solvents e.g. ethylene oxide	55
	Oil workers Petroleum industry	1,1,1-Trichloromethane, Toluene, Xylene	55
	Shoe making	Carbon Disulfide And Benzene	42
	Viscose rayon workers	Nickel, Chlorodecone (Kepone)	40
	Production workers	(EDB) Ethylenedibromide, Lead	40
	Gasoline stations and leaded gasoline	Glycol Ethers, Lead	33
	Ship painting	Carbon monoxide, polycyclic aromatic hydrocarbons	23
	Fire fighters	Carbon disulfide	23
	Rocket fuel	Carbon disulfide	23
	Paints and varnish removers Manufacture of neoprene and rubber accelerators and solvents for sulfur, iodine, bromine, phosphorus, selenium, in paints varnishes	Carbon disulfide	23

	Occupations	Hazard	Rank
L	Cellophane production	Carbon disulfide	23
	Manufacture of carbon tetrachloride	Carbon disulfide	23
	Hairdressers	Perchloroethylene	21
	Laundry ry cleaning workers	Perchloroethylene, Anti-neoplastics	21
	Timber fumigators	EDB Short Term Exposure	21
	Manufacturing firearms	Lead	19
	Pottery workers	Lead	19
	Cable and wire manufacturing, splicing of cable production with leaded based solder	Lead	19
O	Manufacturing batteries	Lead	19
	Lead battery	Lead	19
	Lead working community	Lead Toxicity	19
	Lead smelting and refining	Lead	19
	Painting (red-lead)	Lead	19
W	Production of alloys	Lead	19
	Instructors making lead glazed pottery and crystal glass	Lead	19
	Home re-modelers	Lead	19
	Solderers	Lead	19
	Welders	Lead	19
	Smelter	Lead	19
	Pewter and leaded pane	Lead	19
	Bridge re-painters	Lead	19
	Lead aerosols & microwave radiation	Lead aerosols & microwave radiation	19
	Metal workers	Trichloroethylene	18
R	Embalming	Formaldehyde	16
	Explosive manufactory	Trinitrotoluene (TNT)	15
	Pot room workers	Aluminum	14
	Aluminum production plant	Aluminum	14
	Stainless steel welders	Hexavalent chromium found in Stainless steal, Radiant heat	14
I	Chemical industry	Hydrocarbons, Haloginated Hydrocarbons	13
	Electronic industry	2bromopropane	10
	Atomic workers	Ionizing Radiation (E.G. X-Rays And Gamma Rays). Haloginated Hydrocarbons	Phys.
	Ceramic industry	High temperature	Phys.
	Taxi drivers	Vibration	Phys.
S	Textile manufacturing	Vibration	Phys.
	Nuclear plant	Radiation Exposure	Phys.
	Airline stewardesses	Vibration, Disruption Of Circadian Rhythms, Altitude Changes And Solar Radiation	Phys.
	Leather work	Chlorophenoles, aromatic amines	*
K	Petro-chemical waste	Heavy Metals, Persistent Pesticides, Chlorinated Hydrocarbons And Other Organic Compounds	*
	US navy women	Heavy metals + pesticides + petroleum exposure	*
	Water treatment plants	Heavy Metals, Persistent Pesticides, Chlorinated Hydrocarbons And Other Organic Compounds	*
	House keepers	Anti-neoplastics	*
	Estrogen plant workers	Estrogen	*

* Values not available

Phys.: Physical Hazard

Table 4

A table summarizing the different ranking results and indicating the toxicity level found in each industry by adding up the toxicity levels of the different chemicals used in the same occupation or industry. This table summarizes for each industry what chemicals are used, the rank of this industry according to the total toxicity level of these chemicals as found in the toxicity matrix tables, whether they affect males or females, what reproductive health outcomes these chemicals have and how many units of industries are found in Lebanon in addition to the total number of workers in these units.

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
3210			NA[A]	Semiconductor industry	Ethylene Glycol Ethers [2-Methoxyethanol (2ME), 2-Ethoxyethanol (2EE)], Xylene, Toluene, Trichloroethylene, Trichloroethane Phenols, Isopropyl Alcohol, Arsine Gas, Boric Acid, Thallium, Lead, Cadmium, Radio Frequency, Ionising Radiation	227				F	Fetal loss, miscarriage
2412	8159,82		Y[B]	Pesticide factory workers	(EDB) Ethylenedibromide. 1-2 Dibromo 3chloro Propane (DBCP) Epichlorinehydrin Carbaryl. Organophosphate pesticides: methamidophos and ethyl parathion	122	2	42	37	M	Male reproduction, cancer, decreases in sperm count. Azospermia and oligospermia reduced sperm count and infertility, testicular toxicity, and reduction in sperm motility. Increase sperm aneuploidy
2011/14/22/23/29	7124	742,828	Y	Carpenters	Organic solvents	87	2246	6933	6779	M&F	Spontaneous abortion, still births
3611/12/13/14/15/16/17	8285	742,828	Y	Furniture industry	Organic solvents	87	2075	9640		M&F	Spontaneous abortion, still births
2422			Y	Ink making	Formaldehyde, Aluminium, Isopropyl alcohol, toluene, Xylene	80	141	999		F	Menstrual disorders

[A] NA: To the knowledge of the authors such occupations or industries are not found in Lebanon.
[B] Y: Occupation/industry is available in Lebanon.

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
_____	7231	823	Y	Radiator repairers, Automobile radiator repair, Motor vehicle mechanics	Lead, 1,1,1-Trichloromethane, Toluene, Xylene	74				M&F	Infertility, miscarriage, low birth weight, developmental disorders, stillbirths, (neuro-toxicity and mental retardation). Spontaneous abortion and congenital malformations Failure of blastocyte implantation changes in morphology and implementation in young foetuses, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and peritubular fibrosis, decreased function of prostate and seminal vesicles
2831/32	7141,42	721, 722, 812	Y	Metal casting painters	Glycol ether, 2-Methoxyethanol, 2-Ethoxyethanol	58				M	Testicular atrophy, degeneration of seminiferous tubules, severe oligospermia abnormal sperm morphology, and reduced sperm motility and decreased sperm count.
1921/22/23/25	7442	744	Y	Shoe making	1,1,1-Trichloromethane, Toluene, Xylene	55	1001	5079		M	Spontaneous abortion and congenital malformations
2321/22/23	8155	815	Y	Petrol workers, Refinery workers, Oil workers Petroleum industry	Hydrocarbons, Nickel. Haloginated Hydrocarbons. Rubber chemical solvents e.g. ethylene oxide Carbon Disulfide And Benzene	55	36	311	282	M&F	Women> 40, menstrual disorders, Affect developing embryo, induce hyperglycemia, decreased early and late resorption and increase frequency of stillborn foetuses. Elevation of the infant mortality rate among offspring. Spontaneous abortion, Leukaemia in children
			NA	Viscose rayon workers		42				F	Menstrual abnormalities
			U[Σ]	Production workers	Nickel, Chlorodecone (Kepone)	40				M&F	Affect developing embryo; induce hyperglycemia, decreased early and late resorption and increase frequency of stillborn foetuses. Oligospermia, and reduced sperm motility
____			Y	Gasoline stations and leaded gasoline	(EDB) Ethylenedibromide, Lead	40	3000	9000		M	Male reproduction, cancer, decreases in sperm count, Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumor (childhood cancer of kidney)
3511	7141,42		NA	Ship painting	Glycol Ether, Lead	33	17	33		M	Lower sperm count, Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumour (childhood cancer of kidney)
____	5161	516	Y	Fire fighters	C. monoxide, polycyclic aromatic hydrocarbons	23		1600		M	Child heart defects

[Σ] U: Authors could not find any information about such occupations in Lebanon.

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
			NA	Rocket fuel	Carbon disulfide	23				M&F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
———		714	Y	Paints and varnish removers	Carbon disulfide	23				M&F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
			NA	Manufacture of neoprene and rubber accelerators and solvents for sulphur, iodine, bromine, phosphorus, selenium, in paints varnishes	Carbon disulfide	23				M&F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
			NA	Cellophane production	Carbon disulfide	23				M&F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
2423	8159		NA	Manufacture of carbon tetrachloride	Carbon disulfide	23				M&F	Adverse effect on spermatogenesis, decreased sperm count and more abnormal spermatogenia, menstrual abnormalities and increased incidence of spontaneous abortion and premature birth
———	5141	514	Y	Hairdressers	Perchloroethylene	21	2000	2000		F	Dysmenorrhea, painful menstruation
———	8364		Y	Laundry workers, Dry cleaning workers	Perchloroethylene, Anti-neoplastics	21				M&F	Menstrual disorders including cycle length, menorrhagia, dysmenorrhea, and pre-menstrual syndrome. Significant dose related changes in sperm shape and lateral head displacement. Urinary mutagens, affect gonadal function (in both sexes) zoospermia and over
2010	7421		Y	Timber fumigators	EDB Short Term Exposure	21				M	Decreased sperm velocity, decrease sperm count, viability and motility and morphologic abnormalities
				Total numbers for the high risk industries			**10.518**	**35.637**			

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
2927	8222	822	Y	Manufacturing firearms	Lead	19	29	159		M&F	Failure of blastocyte implantation changes in morphology and implementation in young foetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and per
2691	7321	732	Y	Pottery workers	Lead	19	132	132		F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)
3131	7215	724	Y	Cable and wire manufacturing, splicing of cable production with leaded based solder	Lead	19	2	528		M&F	Failure of blastocyte implantation changes in morphology and implementation in young foetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and per
3141			Y	Manufacturing batteries	Lead	19	5	32		M&F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation), Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumour (childhood cancer of kidney)
			Y	Lead working community	Lead Toxicity	19				M	High rates of infertility, still birth, spontaneous abortion, neonatal death, macrocephaly, and convulsions
			Y	Lead smelting and refining	Lead	19				M	Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumor (childhood cancer of kidney)
———	7141	714	Y	Painting (red-lead)	Lead	19				M	Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumor (childhood cancer of kidney)
2710		721	Y	Production of alloys	Lead	19				M	Related decrease in the conversion of 14C – lactate to carbon dioxide in male germ cells, testis vulnerable, Wilm's Tumor (childhood cancer of kidney)

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
2611/12	7321	732	Y	Instructors making lead glazed pottery and crystal glass	Lead	a 19	118	1044		M&F	Failure of blastocyte implantation changes in morphology and implementation in young foetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and per
——	3471	721,812	Y	Home re-modellers	Lead	19				F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)
——		721,812	Y	Solderers	Lead	19				F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)
2892	7212	812	Y	Welders	Lead	19				F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)
2720			Y	Smelter	Lead	19				M	Reduce fecandability, Failure of blastocyte implantation changes in morphology and implementation in young foetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology.
			U	Pewter and leaded pane	Lead	19				M&F	Failure of blastocyte implantation changes in morphology and implementation in young foetuses, miscarriage, abortion, still births, pre-term delivery, dose related decrease in sperm quality, including density, motility and morphology. Oligo-spermia and per
——	7141,42		NA	Bridge re-painters	Lead	19				F	Infertility, miscarriage, low birth weight, developmental disorders, still births, (neuro-toxicity and mental retardation)
2811/12/ 13/91/92 /93/99	8284	722	Y	Metal workers	Trichloroethylene	18	3554	14492	1398 8	M	Somatic cell mutations and spermatotoxic effects
			U	Embalming	Formaldehyde	16				F	Menstrual disorders

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
2927	8222	822	Y	Explosive manufactory	Trinitrotoluene (TNT)	15	29	159		F	83% experienced change in their menstrual cycle; symptoms diminished to 65% and 20% after 1 and 2 years post exposure respectively
	7321		U	Pot room workers	Aluminum	14				M	Progressive neurological disorders
2720,2811			U	Aluminum production plant	Aluminum	14				M	Progressive neurological disorders
2710	7212	721,812	Y	Stainless steel welders	Hexavalent chromium found in Stainless steal, Radiant heat	14				M	Spontaneous abortion in spouses, Decrease sperm with normal morphology
2423	8159, 8229	822, 311, 815	Y	Chemical industry	Hydrocarbons, Haloginated Hydrocarbons	13	323	2797	2122	M&F	Elevation of the infant mortality rate among offspring. Leukaemia in children
3111/13/15/16/21/22 /31/41/51/55/57/ 98/58/91/93	7242, 7243, 8282/83	828, 724	Y	Electronic industry	2bromopropane	10	208	1589	1460	M	Gonadotoxicity, Azoospermia, Oligospermia, poor sperm motility
2691/92/93	8131, 8139	813,732	Y	Ceramic industry	High temperature	Phys.	104	322		M	Childlessness, difficulty in conceiving
——	8322	832		Taxi drivers	Vibration	Phys.		45000	45000	M	Abnormal morphology of sperm, risk to sperm quality
1711/21/22/ 23/29/31/32 /33/34/39	8286,7432 7435,7436	743, 826, 828	Y	Textile manufacturing	Vibration	Phys.	804	3670	2591	F	3times more likely to develop hyperpolymenorrhea and severe dysmenorrhea
2330			NA	Nuclear plant	Radiation Exposure	Phys.				M	Germ cell mutation, offspring can have leukaemia and non- Hodgkin's lymphoma
			NA	Atomic workers	Ionising Radiation (E.G. X-Rays and Gamma Rays). Haloginated Hydrocarbons	Phys.				M&F	Infertility, miscarriage, birth defects, low birth weight, developmental disorders, childhood cancers. Elevation of the infant mortality rate among offspring
——	3143	511	Y	Airline stewardesses	Vibration, Disruption of Circadian Rhythms, Altitude Changes and Solar Radiation	Phys.		469	191	F	Menstrual disorders. It reverses to pre-flight status with longer jet flight experience
1911/12	7435, 8269	744	Y	Leather work (tanning)	Chlorophenoles, aromatic amines	——	291	1402		F	Small for gestational age children SGA
	8159		U	Petro-chemical waste	Heavy Metals, Persistent Pesticides, Chlorinated Hydrocarbons and Other Organic Compounds	——				M	Fetal loss, mean sperm count decrease, and morphological changes

ISIC	ISCO	Leb. Code	Found	Occupations	Hazard	Rank	Units	Worker	Males	M/F	Reproductive Health Outcome
——	0110		NA	US navy women	Heavy metals + pesticides + petroleum exposure					F	Adverse live birth outcomes
9000	8163	816	Y	Water treatment plants	Heavy Metals, Persistent Pesticides, Chlorinated Hydrocarbons And Other Organic Compounds					M	Fetal loss, mean sperm count decrease, and morphological changes
——	5121	512	Y	House keepers	Anti-neoplastics					M&F	Urinary mutagens, affect gonadal function (in both sexes) zoospermia and ovarian failure, chromosome anomalies, menstrual dysfunction, malformation and Fetal loss, inability to have children
2423			NA	Estrogen plant workers	Estrogen		5.599	71.795		F	Inter-menstrual bleeding
				Total numbers for the Low risk industries			**16.117**	**107423**			
				Total number of all industries at risk							

Table 5

Ranking The Frequency Of Reporting Of Male And Female Reproductive Effects, According To The Medical Literature Used In This Study.

Reproductive health Outcomes	M	F	M&F	Result
Spontaneous abortion/ Miscarriage	5	6	21	32
Still birth	2	6	12	20
Sperm morphology	7		7	14
Infertility	4	5	5	14
Menstrual disorders		4	9	13
Pre-term delivery /premature birth	1	1	11	13
Sperm motility	6		7	13
Low sperm count	7		5	12
Cancer	9		2	11
Oligospermia	4		7	11
Sperm density	3		6	9
Low birth weight		5	4	9
Developmental disorders		5	3	8
Mental retardation		5	2	7
Neuro- toxicity		5	2	7
Peritubular fibrosis	1		6	7
Blastocyte implantation	1		6	7
Conversion of carbon dioxide in male germ cells	6		1	7
Decreased function of prostate	1		6	7
Spermatogenesis	1		5	6
Seminal vesicles	1		5	6
Fetal Loss	2	1	3	6
Dys-menorrhea		2	1	3
Leukemia	1		2	3
Infant mortality rate			3	3
Chromosome anomalies			2	2
Neuro-logic disorders	2			2
Congenital malformation	1		1	2
Azoospermia	2			2
Zoospermia			2	2
Ovarian failure			2	2
Hyper-glycemia			2	2
Urinary mutagens			2	2
Affect the embryo			2	2
Birth defects/ severe live birth outcomes		1	1	2
Malformation			2	2
Painful menstruation		1		1
Menorrahgia			1	1
Pre-menstrual syndrome			1	1
Inter-menstrual bleeding		1		1
Neonatal death	1			1
Somatic cell mutations	1			1
Germ cell mutations	1			1
Gonado-toxicity	1			1
Convulsions	1			1
Macrocephaly	1			1
Child heart defects	1			1
Seminiferous tubules	1			1
Reduce fecundability	1			1
Sperm aneuploidy	1			1
Testicular toxicity	1			1
Testicular atrophy	1			1
Hyper-polymenorrhea		1		1

M: Male reprodcutive system. F: Female reprodcutive system

Appendix II

I. Consent Form (Arabic And English Versions)

II. The Questionnaires Used To Collect Data:

II.1. A Questionnaire Addressing Management
II.2. A Questionnaire Addressing Male Workers
II.3. A Questionnaire Addressing Female Workers

III. Sample Of Letters Sent To Syndicates

IV. Letter Of Approval of Abstract Presentation By BOHS

Occupational Chemical Study - Consent Form

I, ..., acknowledge that Dr. Hatjian and his research assistant Miss Bader Younes have explained to me the purpose of this reproductive and occupational hazard exposure assessment study. I have been given an information sheet summarizing this and the procedures to be followed. My signature on this consent form indicates my agreement to participate.

I understand that I am NOT being asked to modify my work practices in any way that may increase my exposure to chemicals or any other type of hazard in my occupational environment.

I agree to provide answers to all questions in the questionnaires used in this study as specified on the information sheet, for the purpose of determining whether the work place hazards are potentially adversely affecting my health.

I understand that I am free to withdraw from this study at any time or to refuse to divulge any information requested on the forms.

I understand that the data obtained from this study remains the property of Dr. Hatjian and his research assistant Miss Bader Younes but that they are willing to disclose to me the results obtained from my own questionnaire. I acknowledge their right to report the results of the study provided that I retain my anonymity in any such report.

Signed .....

Witness .....

Date .....

UNFPA
United Nations Population Fund

دراسة عن التعرض المهني للمواد الكيميائية

نموذج موافقة

انا الموقع ادناه.....اعلن ان الدكتور برج هتجيان ومساعدته الانسة بدر يونس، قد شرحا لي هدف الدراسة حول تقييم التعرض لمخاطر العمل على الصحة الانجابية، فمن اهداف هذه الدراسة:

١ـ تحديد المخاطر المهنية التي توثر سلباً على الصحة الانجابية في بيئة العمل في لبنان.
٢ـ تقييم مدى التعرض للمخاطر المهنية التي تؤثر على الصحة الانجابية ومدى انتشارها في بيئة العمل في لبنان.
٣ـ تمييز المخاطر المهنية المباشرة وغير المباشرة التي تؤثر في الصحة الانجابية للقوة العاملة.
٤ـ احصاء القوة العامة المعرضة لتأثير المحاطر المهنية على الصحة الانجابية، وتقييم الكلفة المترتبة جراء ذلك على الاقتصاد الوطني بما يساعد في الحد من المخاطر المهنية على الصحة الانجابية في لبنان.

وإنني بتوقيع هذه النموذج اعلن موافقتي على المشاركة في هذه الدراسة، واقرّ بأنه لم يطلب مني تغيير اسلوب عملي ما قد يزيد من تعرضي للمواد الكيماوية او لأي مخاطر مهنية، او اي نوع من الاخطار الناتجة عن بيئة العمل.

انني اوافق على الاجابة عن جميع الاسئلة الواردة في الاستمارة المخصصة لهذه الدراسة كما هو مبيّن في ورقة المعلومات، بهدف تقييم تأثير مخاطر بيئة عملي في صحتي.

كما انني مدرك تماماً لحريتي الكاملة في سحب مشاركتي من هذه الدراسة في اي وقت ورفض اعطاء اي معلومات، اي معلومات لا ارغب في الافصاح عنها.

وادرك ان جميع المعلومات التي سيتم جمعها في هذه الدراسة ستكون تحت تصرف الدكتور برج هتجيان ومساعدته الآنسة بدر يونس من كلية الصحة العامة وعلومها في جامعة البلمند، غير انهما على استعداد لاعلامي بنتائج الاستمارة الخاصة بي. ووافق على حقهما في نشر نتائج هذه الدراسة، شرط الابقاء على سرية هويتي.

التوقيع:.....

شاهد:.....

التاريخ:.....

جامعة البلمند

كلية الصحة العامة وعلومها

بالتعاون مع صندوق الأمم المتحدة للسكان، ومنظمة العمل الدولية

استمارة موجهة للإدارة

المؤسسة.....

عنوان المؤسسة.....

١ـ العمر (حدد بالسنوات).....

٢ـ المستوى العلمي: ☐ غير متعلم ☐ إبتدائي ☐ متوسطي

☐ ثانوي ☐ مهني ☐ جامعي

٣ـ عنوان المنزل الحالي: شارع.....

منطقة.....

محافظة.....

٤ـ الوضع العائلي: ☐أعزب ☐متزوج ☐أرمل ☐منفصل

إذا كنت متزوجا»، حدد سنة الزواج: .....

٥ـ كم عامل يعمل لديك في المصنع؟ .....

٦ـ هل تعتقد أن بيئة العمل تعرضك أو تعرض العمال لأي مخاطر قد تؤثر على الصحة العامة؟

☐ نعم ☐ لا ☐ لا أدري

٧ـ إذا نعم، ما هي هذه المخاطر برأيك؟ .....

.....

.....

ما هي آثارها على الصحة العامة؟ .....

ما هي آثارها على الصحة الإنجابية؟ .....

٨ـ هل تعتقد أن العمال يمكن أن ينقلوا هذه المخاطر معهم إلى عائلتهم؟

☐ نعم ☐ لا ☐ لا أدري

إذا نعم، كيف؟ .....

٩ـ هل قامت الإدارة بتنظيم حملات توعية للعمال تتعلق بالسلامة والصحة المهنية؟

☐ نعم ☐ لا

١٠ـ إذا نعم، ما هي المواضيع التي تم تناولها خلال حملات التوعية هذه؟

١) .....

٢) .....

٣) .....

١١ـ من قام بهذه الحملات؟ .....

١٢ـ متى وكم دامت مدتها؟ .....

١٣ـ هل تعتقد أن هناك قوانين تحدد مسؤوليات وواجبات رب العمل و/أو العمال بالنسبة للسلامة والصحة المهنية؟

☐ نعم ☐ لا ☐ لا أدري

١٤ـ ما هي الوزارة المختصة بالسلامة والصحة المهنية؟

☐ وزارة البيئة ☐ وزارة الصحة العامة

☐ وزارة الصناعة ☐ وزارة العمل

☐ لا أحد ☐ غيرها.....

١٥ـ هل تعتقد انه من المهم إعطاء معلومات للعمال حول مخاطر العمل على الصحة الإنجابية؟

☐ نعم ☐ لا ☐ لا أدري

١٦ـ هل لديك معلومات حول مخاطر العمل على الصحة الإنجابية؟ ☐ نعم ☐ لا

١٧ـ إذا نعم، ما هي المصادر التي تستقي منها معلوماتك؟

☐ الصحف والمجلات ☐ منشورات مختلفة

☐ التلفزيون ☐ حلقات تثقيف، محاضرات

☐ الراديو ☐ أولادك

☐ أصدقاؤك ☐ معلومات عامة

☐ الإنترنت ☐ غيرها.....

١٨ـ ما هي الوسيلة الإعلامية التي تفضلها لتلقي معلومات صحية؟

☐ التلفزيون، حدد القناة:.....

☐ الراديو، حدد الإذاعة:.....

☐ المجلات، حدد:.....

☐ الجرائد، حدد:.....

☐ ملصقات

☐ غيره، حدد:.....

١٩ـ ما هي الأوقات التي تشاهد فيها التلفزيون أكثر:

☐ ٦ـ٨ مساءً

☐ ٨ـ١٠ مساءً

☐ بعد العاشرة ليلاً

☐ الفترة الصباحية

☐ فترة بعد الظهر

☐ غيره، حدد.....

٢٠ـ ما هي الأوقات التي تستمع فيها إلى الراديو أكثر:

☐ في الصباح

☐ خلال فترة العمل الصباحيةً

☐ ظهراً وبعد الظهر

☐ في بداية السهرة

☐ مساءً وقبل النوم

☐ لا أسمع الراديو عادةس

☐ نهاية الأسبوع

جامعة البلمند

كلية الصحة العامة وعلومها

بالتعاون مع صندوق الأمم المتحدة للسكان، ومنظمة العمل الدولية

استمارة موجهة إلى الرجال

أ- المعلومات الديموغرافية:

المؤسسة.....

عنوان المؤسسة.....

١- العمر (حدد بالسنوات).....

٢- المستوى العلمي: ☐ غير متعلم ☐ إبتدائي ☐ متوسطي

☐ ثانوي ☐ مهني ☐ جامعي

٣- الجنسية:.....

٤- عنوان المنزل الحالي: منطقة.....

محافظة.....

٥- منذ كم عام تقيم في هذا العنوان؟.....

٦- الوضع العائلي: ☐ أعزب ☐ متزوج ☐ أرمل ☐ منفصل

إذا كنت متزوجا«، حدد سنة الزواج.....

٧- هل لديك أولاد ☐ نعم كم يبلغ عددهم؟.....

☐ لا

٨- تقريباً كم يبلغ مدخول العائلة الإجمالي بالشهر؟.....

٩- كم يبلغ مدخولك الشهري الخاص؟.....

ب ـ معلومات عن مؤسسة العمل والتاريخ المهني منذ أن بدأت العمل:

التاريخ	عدد السنوات	نوع الوظيفة	نوع المؤسسة	عنوان المؤسسة

ج ـ بيئة العمل:

١ـ هل تعتقد أن عملك يعرضك لأي مخاطر قد تؤثر على صحتك العامة؟

☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد

٢ـ إذا نعم، عدد المخاطر، وما هي آثارها على الصحة، وأن كنت تعتقد أنها تؤثر على صحتك الإنجابية بما في ذلك الخصوبة والقدرة على الإنجاب.

المخاطر	ما هي آثارها على الصحة؟	هل تعتقد أنها تؤثر على صحتك الإنجابية أي الخصوبة وقدرتك على الإنجاب؟
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد

٣ـ هل تعتقد بأنه إذا تعرضت لتلك المخاطر يمكن أن تنقلها معك إلى عائلتك؟

☐ نعم ☐ لا ☐ لا أدري

إذا نعم، كيف؟ .....

د ـ الصحة الجسدية العامة:

١ـ كيف تصف حالتك الصحية العامة؟

☐ ممتازة ☐ جيدة ☐ مقبولة ☐ سيئة ☐ سيئة جداً

٢ـ ما رأيك بصحتك منذ الإلتحاق بالعمل الحالي؟

☐ لم تتغير ☐ ساءت ☐ تحسنت

٣ـ هل تعاني من عوارض جسدية أكثر من الأول؟

☐ دائماً ☐ أحياناً ☐ قليلاً ☐ أبداً

إذا نعم، ما هي؟ .....

٤ـ هل تدخن حالياً على الأقل سيجارة واحدة كل يوم؟ ☐ نعم ☐ لا

إذا نعم، كم سيجارة تدخن باليوم؟ .....

٥ـ هل كنت تدخن سابقا على الأقل سيجارة واحدة كل يوم ؟ ☐ نعم ☐ لا

٦ـ بالنسبة لاستعمال النرجيلة:

☐ لا أستعملها إطلاقاً

☐ أستعملها عادةً مرة واحدة في الأسبوع

☐ أستعملها عادةً أكثر من مرة بالأسبوع

☐ أستعملها بالمناسبات

٧ـ هل تشرب الكحول؟

☐ لا أشرب الكحول إطلاقاً

☐ أشرب الكحول عادةً مرة واحدة في الأسبوع

☐ أشرب الكحول عادةً أكثر من مرة بالأسبوع

☐ أشرب الكحول عادةً بالمناسبات

هـ ـ الصحة الإنجابية:

١ـ هل عانيت/ تعاني من أي مشكلة في الخصوبة والإنجاب إقتضت تشخيصاً طبياً ومعالجة؟

☐ لا

☐ نعم، لم تعالج

☐ نعم، عولجت ولم تنتهي المشكلة

☐ نعم، عولجت وانتهت المشكلة

و ـ أسئلة عن الزوجة:

المعلومات الديموغرافية للزوجة:

١ـ عمر الزوجة (حدد بالسنوات).....

٢ـ المستوى العلمي للزوجة: ☐ غير متعلمة ☐ إبتدائي ☐ متوسطي

☐ ثانوي ☐ مهني ☐ جامعي

معلومات عن مؤسسة العمل والتاريخ المهني للزوجة:

١ـ هل زوجتك تعمل أو كانت تعمل؟ ☐ نعم ☐ لا، إذا لا الرجاء الإنتقال الى الجزء (ز)

إذا نعم، الرجاء ملء الجدول التالي:

التاريخ	عدد السنوات	نوع الوظيفة	نوع المؤسسة	عنوان المؤسسة

ز- الوضع الإنجابي للعائلة:

١- في السنوات الخمس الماضية، هل عانت زوجتك من أي مشكلة في الحمل والإنجاب كمثل:

الإجهاض، ولادة طفل قبل الوقت، وضع جنين ميت ضمن فترة الحمل الطبيعي، وفاة مولود خلال الأسبوع الأول بعد الولادة

☐ لا أعرف

☐ لا لم يحصل

☐ نعم، عانت من مشكلة واحدة، الرجاء التحديد: .....

☐ نعم، عانت من أكثر من مشكلة واحدة، الرجاء التحديد: .....

.....

٢- إذا حصلت لها إحدى هذه المشكلات، هل اضطرت أن تتعالج تحت إشراف طبي؟

☐ نعم ☐ لا ☐ لا أدري

٣- إذا نعم، ما هي الكلفة الإجمالية التقريبية لهذا العلاج (أو العلاجات)؟ .....

ح - الوعي عن مخاطر العمل على الصحة الإنجابية:

١- هل لديك معلومات حول مخاطر العمل على الصحة الإنجابية؟ ☐ نعم ☐ لا

٢- إذا نعم، ما هي المصادر التي تستقي منها معلوماتك؟

☐ الصحف والمجلات ☐ منشورات مختلف

☐ التلفزيون ☐ حلقات تثقيف، محاضرات

☐ الراديو ☐ أولادك

☐ أصدقاؤك ☐ معلومات عامة

☐ الإنترنت ☐ غيرها: .....

٣- ما هي الوسيلة الإعلامية التي تفضلها لتلقي معلومات صحية؟

☐ التلفزيون، حدد القناة:.....

☐ الراديو، حدد الإذاعة:.....

☐ المجلات، حدد:.....

☐ الجرائد، حدد:.....

☐ ملصقات.....

☐ غيره، حدد:.....

٤- ما هي الأوقات التي تشاهد فيها التلفزيون أكثر:

☐ ٦-٨ مساءً ☐ ٨-١٠ مساءً

☐ بعد العاشرة ليلاً ☐ الفترة الصباحية

☐ فترة بعد الظهر ☐ غيره، حدد.....

٥- ما هي الأوقات التي تستمع فيها إلى الراديو أكثر:

☐ في الصباح

☐ خلال فترة العمل الصباحية

☐ ظهراً وبعد الظهر

☐ في بداية السهرة

☐ مساءً وقبل النوم

☐ لا أسمع الراديو عادةً

☐ نهاية الأسبوع

جامعة البلمند

كلية الصحة العامة وعلومها

بالتعاون مع صندوق الأمم المتحدة للسكان، ومنظمة العمل الدولية

استمارة موجهة إلى السيدات

أ ـ المعلومات الديموغرافية:

المؤسسة:.....

عنوان المؤسسة:.....

١ـ العمر (حددي بالسنوات).....

٢ـ المستوى العلمي: ☐ غير متعلمة ☐ إبتدائي ☐ متوسطي

☐ ثانوي ☐ مهني ☐ جامعي

٣ـ الجنسية: .....

٤ـ عنوان المنزل الحالي: الشارع: .....

منطقة: .....

محافظة: .....

٥ـ منذ كم عام تقيمين في هذا العنوان؟ .....

٦ـ الوضع العائلي: ☐ عزباء ☐ متزوجة ☐ أرملة ☐ منفصلة

إذا كنت متزوجة، حددي سنة الزواج: .....

٧ـ هل لديك أولاد ☐ نعم كم يبلغ عددهم؟

☐ لا

٨ـ تقريباً كم يبلغ مدخول العائلة الإجمالي بالشهر؟ .....

٩ـ كم يبلغ مدخولك الشهري الخاص؟ .....

ب ـ معلومات عن مؤسسة العمل والتاريخ المهني منذ أن بدأت العمل:

التاريخ	عدد السنوات	نوع الوظيفة	نوع المؤسسة	عنوان المؤسسة

ج ـ بيئة العمل:

١ـ هل تعتقدين أن عملك يعرضك لأي مخاطر قد تؤثر على صحتك العامة؟

☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكدة

٢ـ إذا نعم، عددي المخاطر، وما هي آثارها على الصحة، وأن كنت تعتقدين أنها تؤثر على قدرتك على الحمل الإنجاب.

المخاطر	ما هي آثارها على الصحة؟	هل تعتقد أنها تؤثر على صحتك الإنجابية أي الخصوبة وقدرتك على الإنجاب؟
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد
		☐ نعم ☐ لا ☐ لا أدري ☐ غير متأكد

٣ـ هل تعتقدين بأنه إذا تعرضت لتلك المخاطر يمكن أن تنقليها معك إلى عائلتك؟

☐ نعم ☐ لا ☐ لا أدري

إذا نعم، كيف؟ .....

د ـ الصحة الجسدية العامة:

١ـ كيف تصفين حالتك الصحية العامة؟

☐ ممتازة ☐ جيدة ☐ مقبولة ☐ سيئة ☐ سيئة جداً

٢ـ ما رأيك بصحتك منذ الإلتحاق بالعمل الحالي؟

☐ لم تتغير ☐ ساءت ☐ تحسنت

٣ـ هل تعانين من عوارض جسدية أكثر من الأول؟

☐ دائماً ☐ أحياناً ☐ قليلاً ☐ أبداً

٤ـ ما هي هذه العوارض .....

٥ـ هل تدخنين حالياً على الأقل سيجارة واحدة كل يوم؟ ☐ نعم ☐ لا

إذا نعم، كم سيجارة تدخن باليوم؟ .....

٦ـ هل كنت تدخنين سابقا على الأقل سيجارة واحدة كل يوم ؟ ☐ نعم ☐ لا

٧ـ بالنسبة لاستعمال النرجيلة:

☐ لا أستعملها إطلاقاً

☐ أستعملها عادةً مرة واحدة في الأسبوع

☐ أستعملها عادةً أكثر من مرة بالأسبوع

☐ أستعملها بالمناسبات

٨ـ هل تشربين الكحول؟

☐ لا أشرب الكحول إطلاقاً

☐ أشرب الكحول عادةً مرة واحدة في الأسبوع

☐ أشرب الكحول عادةً أكثر من مرة بالأسبوع

☐ أشرب الكحول عادةً بالمناسبات

هـ ـ الصحة الإنجابية:

١ـ هل تظنين انك عانيت من مشكلة انجابية مزمنة؟

☐ نعم، حاليا

☐ نعم، سابقاً

☐ لا

٢ـ هل تعالجت من اجل هذه المشكلة؟ ☐ نعم ☐ لا

و ـ أسئلة عن الزوج:

المعلومات الديموغرافية للزوج:

١ـ عمر الزوجة (حددي بالسنوات).....

٢ـ المستوى العلمي للزوج: ☐ غير متعلم ☐ إبتدائي ☐ متوسطي

☐ ثانوي ☐ مهني ☐ جامعي

معلومات عن مؤسسة العمل والتاريخ المهني للزوج:

١ـ هل زوجك يعمل أو كان يعمل سابقاً؟ ☐ نعم ☐ لا، إذا لا الرجاء الإنتقال الى الجزء (ز)

إذا نعم، الرجاء ملء الجدول التالي:

التاريخ	عدد السنوات	نوع الوظيفة	نوع المؤسسة	عنوان المؤسسة

الصحة الجسدية العامة للزوج:

١ـ كيف تصفين حالة زوجك الصحية العامة؟

☐ ممتازة ☐ جيدة ☐ مقبولة ☐ سيئة ☐ سيئة جداً

٢ـ هل يدخن زوجة حالياً على الأقل سيجارة واحدة كل يوم؟ ☐ نعم ☐ لا

اذا نعم كم سيجارة يدخن في اليوم؟

٣ـ هل كان يدخن سابقاً على الاقل سيجارة واحدة كل يوم؟ ☐ نعم ☐ لا

٤ـ بالنسبة لاستعمال النرجيلة، هل يستعمل زوجة النرجيلة:

☐ لا يستعملها إطلاقاً

☐ يستعملها عادةً مرة واحدة في الأسبوع

☐ يستعملها عادةً أكثر من مرة بالأسبوع

☐ يستعملها بالمناسبات

٥ـ هل يشرب زوجك الكحول؟

☐ لا يشرب الكحول إطلاقاً

☐ يشرب الكحول عادةً مرة واحدة في الأسبوع

☐ يشرب الكحول عادةً أكثر من مرة بالأسبوع

☐ يشرب الكحول عادةً بالمناسبات

الصحة الانجابية للزوج:

١ـ هل عانى زوجة خلال السنوات الخمس الماضية من اية مشكلة في اعضائه التناسلية او في قدرته على الانجاب؟

☐ نعم ☐ لا ☐ لا ادري ☐ غير متأكدة

٢ـ اذا نعم هل تعالج من اجل هذه المشكلة؟

☐ نعم، عولج وانتهت المشكلة

☐ نعم، عولج ولم تنتهي المشكلة بعد

☐ لا، لم يعالج

ز ـ الوضع الإنجابي للعائلة:

١ـ الرجاء التفصيل بالتسلسل الزمني ابتداءً من المشكلة الاقرب الى اليوم وبالعودة الى ٥ سنوات، مشاكل الصحة الانجابية التي عانيت/ تعانين منها بما فيها: ١ـ الاجهاض، ٢ـ ولادة طفل قبل الوقت، ٣ـ وضع جنين ميت ضمن فترة الحمل الطبيعي، ٤ـ وفاة مولود خلال اول اسبوع بعد الولادة.

التاريخ	مشكلات صحية او ادوية خلال الحمل	مدة الحمل	المشاكل				جنس المولود
			إجهاض	ولادة طفل قبل الوقت	وضع جنين ميت ضمن فترة الحمل الطبيعي	وفاة مولود خلال اول اسبوع بعد الولادة	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	
			☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	☐ نعم ☐ لا	

حالات الاجهاض او ولادة طفل ميت (ان لم يحصل اذهب الى ح):

في حال الاجهاض المتكرر (> من مرة واحدة) او ولادة طفل ميت ما كان السبب برأيك؟

....

٢ـ هل قمت باستشارة طبيب مختص حول هذه المشكلة؟ ☐ نعم ☐ لا

٣ـ في حال قمت بأخذ اي علاج، ما كانت كلفة هذا العلاج الاجمالية؟ ....

٤ـ كم يوم تغيبت عن العمل بسبب العلاج؟

☐ لم اتغيب

☐ تغيبت اقل من اسبوع

☐ تغيبت بين الاسبوع والشهر

☐ تغيبت اكثر من شهر، حددي كم شهر غبت: ....

ح ـ الوعي عن مخاطر العمل على الصحة الإنجابية:

١ـ هل لديك معلومات حول مخاطر العمل على الصحة الإنجابية؟ ☐ نعم ☐ لا

٢ـ إذا نعم، ما هي المصادر التي تستقين منها معلوماتك؟

☐ الصحف والمجلات ☐ منشورات مختلفة

☐ التلفزيون ☐ حلقات تثقيف، محاضرات

☐ الراديو ☐ أولادك

☐ أصدقاؤك ☐ معلومات عامة

☐ الإنترنت ☐ غيرها: .....

٣ـ ما هي الوسيلة الإعلامية التي تفضلينها لتلقي معلومات صحية؟

☐ التلفزيون، حددي القناة: .....

☐ الراديو، حددي الإذاعة: .....

☐ المجلات، حددي: .....

☐ الجرائد، حددي: .....

☐ ملصقات

☐ غيره، حددي: .....

٤ـ ما هي الأوقات التي تشاهد فيها التلفزيون أكثر:

☐ ٦–٨ مساءً ☐ ٨–١٠ مساءً

☐ بعد العاشرة ليلاً ☐ الفترة الصباحية

☐ فترة بعد الظهر ☐ غيره، حدد: .....

٥ ما هي الأوقات التي تستمعين فيها إلى الراديو أكثر:

☐ في الصباح

☐ خلال فترة العمل الصباحية

☐ ظهراً وبعد الظهر

☐ في بداية السهرة

☐ مساءً وقبل النوم

☐ لا أسمع الراديو عادةً

حضرة الاستاذ جرجي الخوري المحترم،

وزارة الصناعة

بيروت ـ لبنان

تحية وبعد،

تتمنى كلية الصحة العامة وعلومها في جامعة البلمند من جانبكم تزويدها دليلاً عن المصانع والصناعات في لبنان.

ان جامعة البلمند، اذ تشكر تعاونكم، تأمل ان يستمر العمل البنّاء بينها وبين ادارتكم الكريمة لما فيه المصلحة العامة في لبنان.

تفضلوا بقبول جزيل الشكر

دكتور نديم كرم

عميد كلية الصحة العامة، جامعةالبلمند

جامعة البلمند

كلية الصحة العامة وعلومها

بيروت ــ لبنان

٢٣ شباط ٢٠٠١

جانب نقيب اطباء الاسنان المحترم،

الموضوع: مسح يطال محاطر العمل وتأثيرها على الصحة الانجابية

تحية طيبة وبعد،

تقوم كلية الصحة العامة وعلومها في جامعمة البلمند بدراسة حول «مخاطر العمل وتأثيرها على الصحة الانجابية للعمال».

يهدف مشروع البحث الى:

١ـ تحديد المخاطر المهنية التي تؤثر سلباً على الصحة الانجابية في بيئة العمل في لبنان

٢ـ تقيين مدى العرض للمخاطر المهنية التي تؤثر على الصحة الانجابية في بيئة العمل في لبنان وانتشارها.

٣ـ تمييز المخاطر المهنية المباشرة وغير المباشرة المؤثرة على الصحة الانجابية للقوة العاملة.

٤ـ احصاء القوة العاملة المعرضة لتأثير المخاطر المهنية على الصحة الانجابية، وتقييم الكلفة المترتبة جراء ذلك على الاقتصاد الوطني بما يساعد في الحد من المخاطر المهنية على الصحة الانجابية في لبنان.

انطلاقا من هذه الاهداف، نتمنى عليكم تزويدنا بالإحصآت والمراجع اللازمة حول عدد اطباء الاسنان في لبنان وتوزيعهم حسب الجنس.

نشكر لكم تعاونكم لما فيه حسن تنفيذ هذه الدراسة الملحة

دكتور بَرج هتجيان

مدير برنامج الصحة العامة وعلوم التنمية»

كلية الصحة العامة ـ جامعة البلمند

جامعة البلمند

كلية الصحة العامة وعلومها

بيروت ــ لبنان

٤ أيار ٢٠٠١

جانب نقيب الصيادلة الدكتورة ليلى خوري المحترمة،

الموضوع: مسح يطال محاطر العمل وتأثيرها على الصحة الانجابية

تحية طيبة وبعد،

تقوم كلية الصحة العامة وعلومها في جامعة البلمند بدراسة حول «مخاطر العمل وتأثيرها على الصحة الانجابية للعمال».

يهدف مشروع البحث الى:

١ـ تحديد المخاطر المهنية التي تؤثر سلباً على الصحة الانجابية في بيئة العمل في لبنان

٢ـ تقيين مدى العرض للمخاطر المهنية التي تؤثر على الصحة الانجابية في بيئة العمل في لبنان وانتشارها.

٣ـ تمييز المخاطر المهنية المباشرة وغير المباشرة المؤثرة على الصحة الانجابية للقوة العاملة.

٤ـ احصاء القوة العاملة المعرضة لتأثير المخاطر المهنية على الصحة الانجابية، وتقييم الكلفة المترتبة جراء ذلك على الاقتصاد الوطني بما يساعد في الحد من المخاطر المهنية على الصحة الانجابية في لبنان.

انطلاقا من هذه الاهداف، نتمنى عليكم تزويدنا بالإحصآت والمراجع اللازمة حول عدد الصيادلة في لبنان.

نشكر لكم تعاونكم لما فيه حسن تنفيذ هذه الدراسة الملحة

دكتور بَرج هتجيان

مدير برنامج الصحة العامة وعلوم التنمية»

كلية الصحة العامة ـ جامعة البلمند

BOHS
BRITISH OCCUPATIONAL HYGIENE SOCIETY
Felix qui potuit rerum cognoscere causas

4 December 2001

Berj Hatijan
Faculty of Health Sceinces
University of Balamand
Saint George Health Complex
PO Box 166378
Ashrafieh
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Dear Mr Hatijan

Occupational Hygiene 2002: 9-11 April 2002
Cutlers Hall, Sheffield

I write on behalf of Conference Committee to advise you that your abstract entitled:

Situation analysis on: occupational hazards and their impact on reproductive health

has been accepted for presentation during Tuesday 9 April 2002. Your presentation will be limited to 20 minutes to include five minutes discussion time.

The Conference Registration fee will be waived for the day on which your presentation is given. To claim this concession, if attending for one day only, please deduct the whole of the one day fee, or if attending for longer, deduct the amount of the one day fee from the full fee (as detailed on the Registration Form). Travelling and/or accommodation expenses will not be paid.

A copy of the final Conference Programme, which contains details of the actual time of your presentation, should have already arrived with you by post or is available on www.bohs.org.

An abstract of this presentation, (additional to the one submitted in response to the Call for Papers) should be sent here by 18 January 2001, (preferably by email as a Word attachment), **at the latest**, so that it may be included in the Abstract Booklet which is issued to all delegates at the conference. This is particularly important if your initial abstract was faxed or did not come directly to the secretariat. If we do not receive a clean copy, we will be unable to include it in the Abstract Booklet.

Please don't hesitate to contact me if you have any queries.

I look forward to meeting you in Sheffield.

Yours sincerely

Miss Krissy Robinson
Conference Administration

Tuesday 9 April 2002

Session 1 - Opening Session – The Main Hall

1030-1035 Chairman's Introduction: *Brian Holyoak, President BOHS 2001-2002*

1035-1120 **The Warner Lecture:** Partnership for sustaining healthy workplaces
Prof. Richard Ennals

1120-1130 Break - please note that refreshments will *not* be available during this short break

1130-1200 Securing Health Together and HSE revitalising agenda
Sandra Caldwell, HSE

1200-1230 Perspectives on hygiene
Kerry Gardiner, University of Birmingham

1230-1330 Lunch

Session 2A – Controlling Exposure The Main Hall	**Time**	**Session 2B – Understanding Exposure The Drawing Room**
Chairman's Introduction: *Robin Howie*	**1330**	Chairman's Introduction: *Lynne Morgan*
Situation analysis on occupational hazards and their impact on reproductive health *Berj Hatjian, University of Balamand, Beirut*	**1335**	Chemical processed based reconstruction of exposures: estimation of task based exposures – method selection *T A Hall, University of Oklahoma, USA*
Dust control by a combination of local exhaust ventilation and local air displacement *Mark Piney, HSE*	**1355**	Chemical processed based reconstruction of exposures: estimation of task based exposures – A case study *Nurtan Esmen, University of Oklahoma, USA*
Open system chemical operations *Frank Renshaw, Rohm and Haas Company*	**1415**	A proposal for evaluation of exposure data *Erik Tielemans, TNO Chemistry*
Substances hazardous to health: effective control strategies or going through the motions *Alvin Woolley, Alvin J Woolley Associates*	**1435**	Short term exposure to highly toxic organic chemicals *Martin Stear, HSE*

1455-1530 Tea

Appendix III

Figures (1 to 5)
Photos (1 to 16)

Figure 1

Distribution of Working Population at a Potential Risk from Direct or Indirect Exposure to Occupational Hazards Affecting Reproductive Health.
The Estimate Total Population at Risk a Potential Risk is Approximately 344,000 Workers.

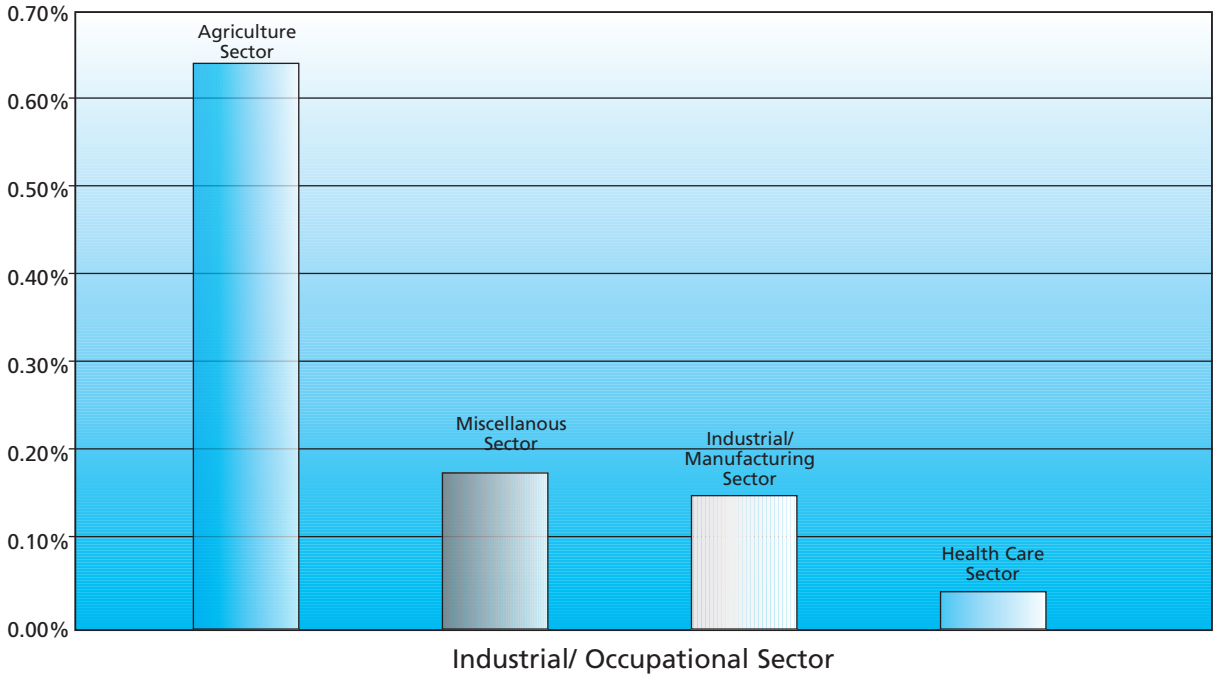


Figure 2

Distribution of Workers and Industries in Relation to Reproductive Health Hazards.
The Total Number of SMEs and the Number Hosting Occupational Hazards Associated with Reproductive Health.

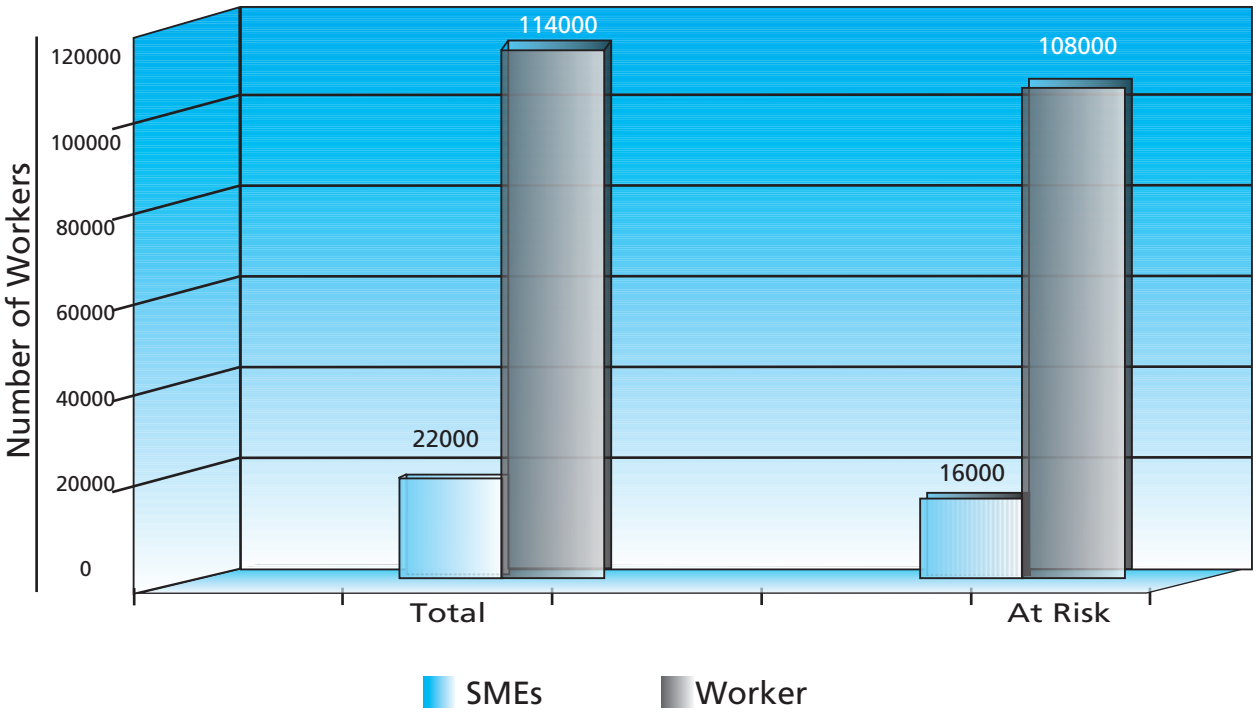


Figure 3

The Estimated Total Number of Industry Hosting Occupational Hazard to Reproductive Health and their Distribution to Low and High-Risk-Margin Industry According to Risk Hierarchy Categorization in the Study.

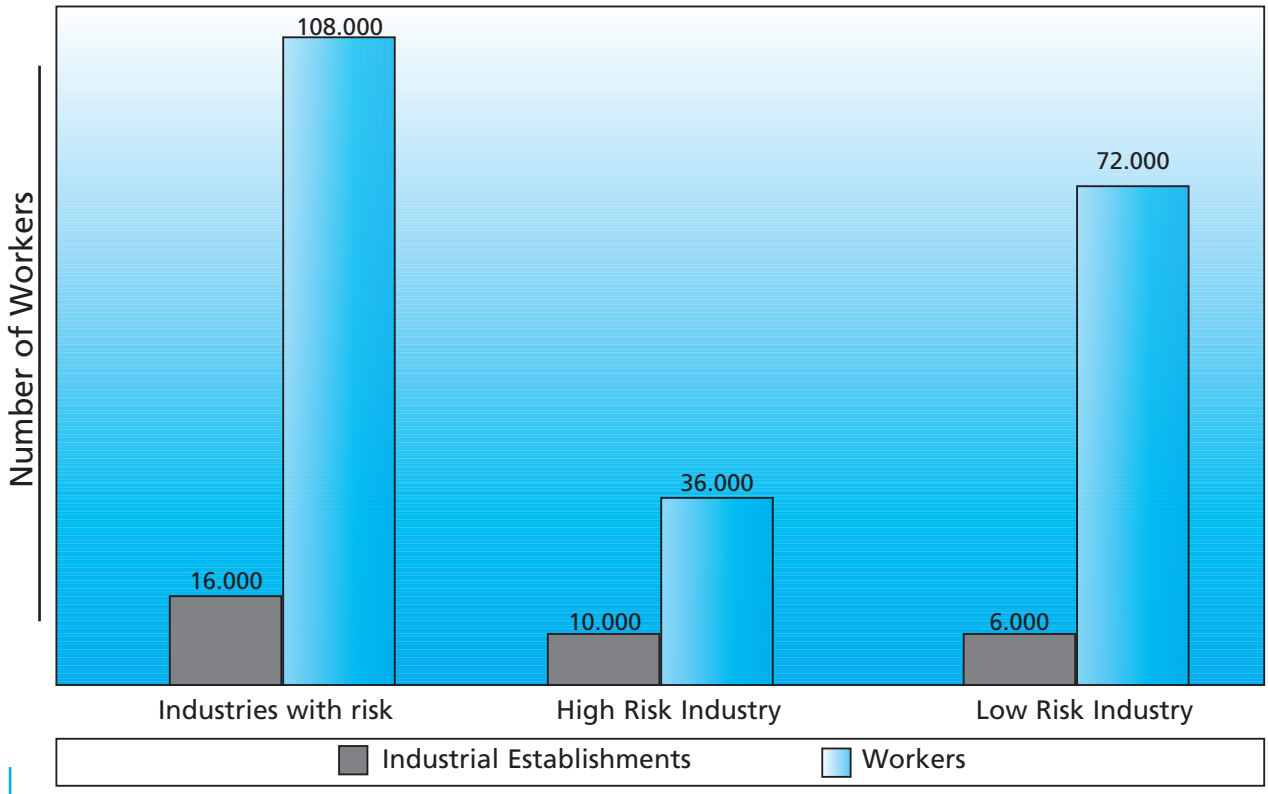


Figure 4

The Estimated Total Number of the Lebanese Workforce in High-Risk-Margin Industry and their Distribution According to Types of Industries Chosen for this Study.

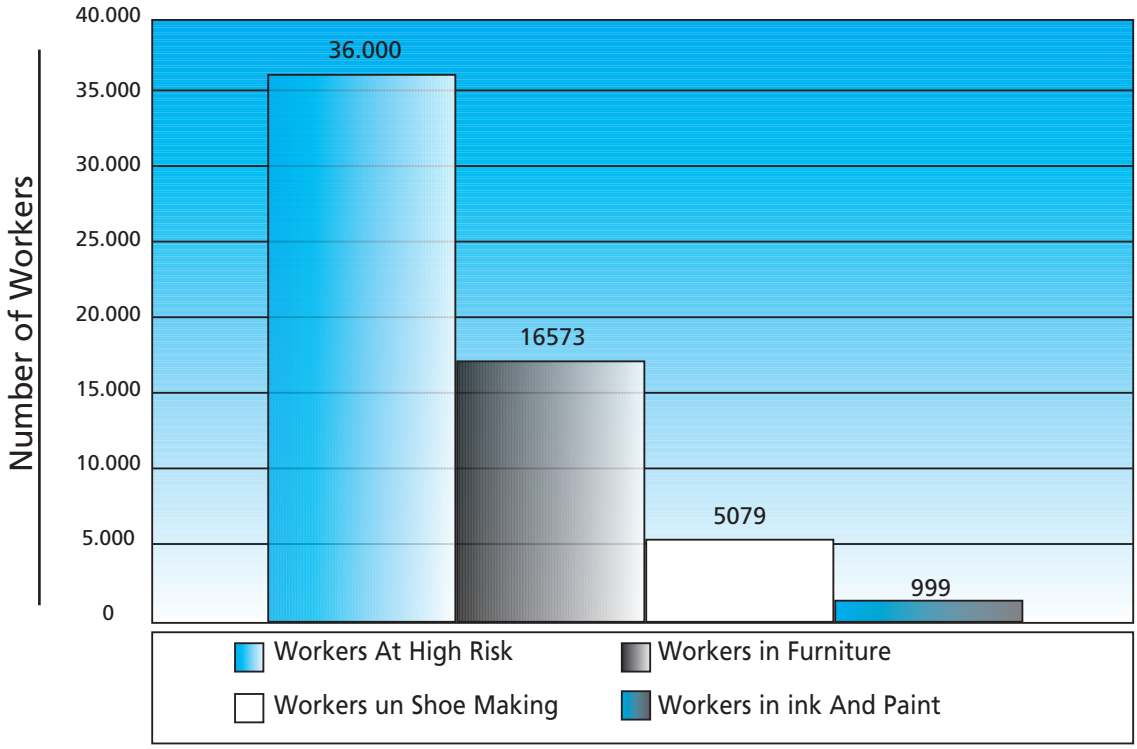
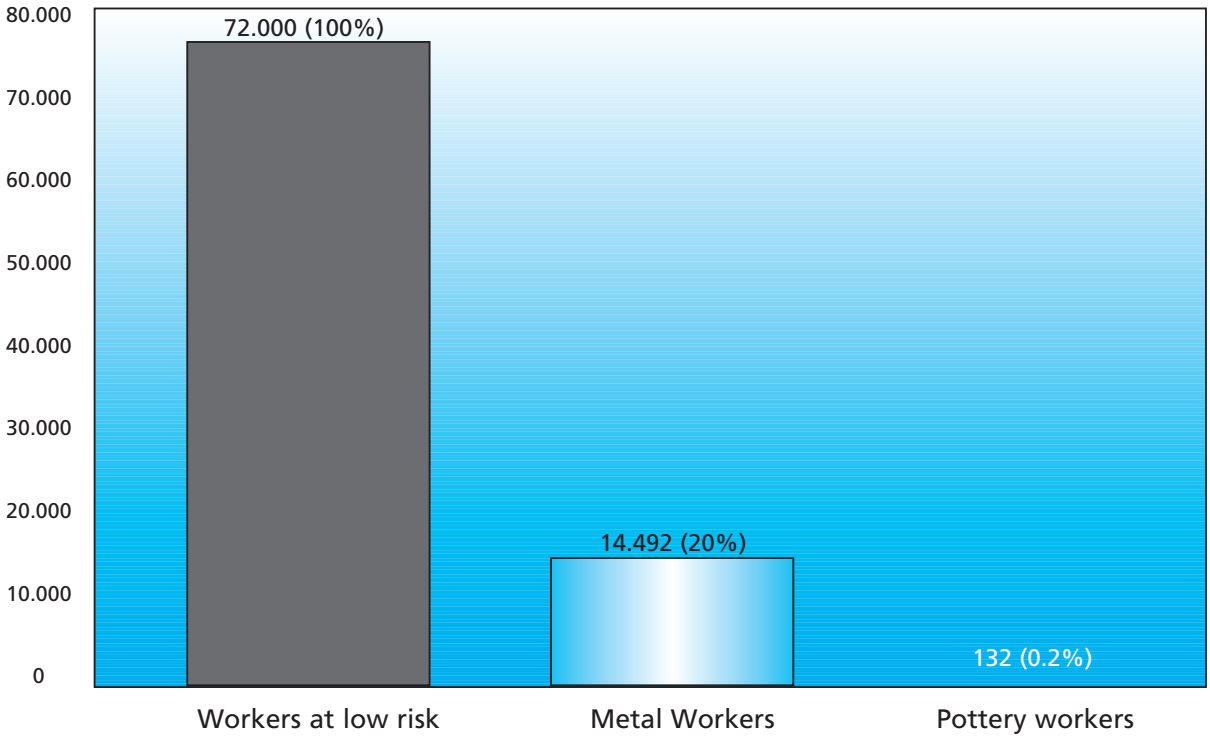


Figure 5

The Estimated Total Number Of The Lebanese Workforce In High Risk Industry And Their Distribution According To Types Of Industry Chosen For This Study.



Photos (1-16)

Photo 1: Past and dust all over hair and skin of worker, thus potentially increasing exposure to chemicals through skin absorption or inhalation.

Photo 2: Gluing with fingers, and using pastes to wipe fingers, thus potentially increasing chemicals through direct or indirect skin contamination.

Photo 3: General lavatory hygiene condition unacceptable. (Observe the hygiene conditions of the door to the lavatory. The conditions inside were by no means acceptable).

Photo 4: General hygiene in industrial premises are not acceptable. This may increase overall potential exposure to occupational hazards.

Photo 5: The unavailability of rest rooms for a break may lead to potential contamination of consumed food by workers.

Photo 6: Poor lighting in the industrial premises is a key factor that potentially may affect working exposure to hazards (chemical and physical).

Photo 7: Poor lighting in the industrial premises is a key factor that potentially may affect working exposure to hazards (chemical and physical).

Photo 8: The total absence of local exhaust ventilation and the utilisation of general ventilation is an unacceptable practice. It does not protect the worker.
In some instances in fact if badly designed may increase worker exposure to chemicals
(see general ventilation in the middle of photo).

Photo 9: The haze in the photo is a definite proof of the absence of adequate ventilation for the protection of the worker. The airborne chemical may have the capacity to penetrate through skin and therefore the worker is by no means fully protected.

Photo 10: Potential cross contamination between food and chemical hazards. This is due to the unavailability of eating spaces that have minimum level of hygiene.

Photo 11: The unavailability of changing rooms is leading to potential contamination of workers daily clothes by chemicals. This may also lead to carrying chemicals to the home environment and thus exposing the members of the family.

Photo 12: Chemicals are haphazardly stored. This is a potential risk to workers health in their working environment.

Photo 13: Chemicals are haphazardly stored. This is a potential risk to workers health in their working environment.

Photo 14: Chemicals are haphazardly stored. This is a potential risk to workers health in their working environment (see the handwritten notice on the wall that labels the chemicals as poisonous).

Photo 15: Chemicals are haphazardly stored. This is a potential risk to workers health in their working environment.

Photo 16: Chemicals are haphazardly stored. This is a potential risk to workers health in their working environment (see the source of gas, ignition and flammable liquids stored side by side). This is by no means acceptable for both health and safety purposes.

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