

WORK UNDERGROUND, MINERS SPEAK OUT – A CONCERNING SCENARIO FOR WORKPLACE HEALTH AND SAFETY NURSING¹

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ABSTRACT

The conditions in subsurface mines are extreme: at any moment, the miner may witness or suffer fatal, disabling or mutilating accidents. This is a descriptive-exploratory study with a qualitative approach, aiming to investigate and discuss the miner's work conditions, the factors associated with the risk of occupational exposure, and its implications for work in subsurface mines. Data collection took place in 2010, with six retired miners who accepted to participate in the study, which had been previously approved by the Research Ethics Committee. Three thematic categories emerged from the corpus of the content analysis: work conditions: *the mine...*; factors associated with the risk of occupational exposure: *I worked...*; implications for the work in mines: *it would be important that...* The facing of environmental risks, the care for the body, and illnesses and accidents reveal that how the work is organized, and the work practices, cause the miner suffering. The issue of worker's health goes beyond technique and requires the action of professionals, such as the Workplace Health and Safety Nurse, to promote health.

Keywords: Occupational Health Nursing. Environmental risks. Worker's health. Subsurface mines. Workers.

INTRODUCTION

Work is an inseparable component of daily experiences in humans' process of living. It is a space of dreams, aspirations and desires, and involves the person as a whole, with his creative ability to think, become involved, show himself, and to exteriorizing himself in the world of relationships, making him a social being in constant formation and transformation⁽¹⁾.

The tragedies in the news from around the world - involving miners in extreme situations resulting from the inexistence of the escape routes or refuge points which are necessary for their survival - betray the need for a perspective which is more attentive to the issues of health and safety in the mines.

Understanding the miner's actual working conditions can contribute to functioning more effectively with workers exposed to extreme work conditions and situations. Below ground,

physical effort, exposure to noise, dust, heat, cold, explosions, earth tremors, poisonous gases and inadequate ventilation are important components which should inform sufficiently safe preventive measures for health and safety.

The extraction of minerals, in many regions of the world, has great economic impact⁽²⁾, which, while on the one hand helping to ensure work and development, on the other, leaves marks and scars of death and disability. Considering the worker's body, the pressures linked to working conditions in the mines can cause strain and illnesses. In this setting, respiratory conditions typical for the work environment in the mines, such as rhinitis and bronchitic asthma are fairly common. In addition to these, the worker is affected by illnesses with little immediate contemporaneous impact, resulting from the excessive demands for high production, such as anxiety, depression, or gastritis, which have repercussions not only on their integration into

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society, but also on their production⁽³⁾.

It falls to professionals in Workers' Health to be alert to the manifestations of threats to miners' health, even those which remain latent or hidden. It is therefore essential for these professionals to establish relationships and explanations regarding illness among those who work in the mines, investing in the prevention of illnesses which are specific to the workplace, being alert to those workers with the greatest loss in productive capacity, and making efforts allowing them to cope with the risk of death⁽³⁾. From this perspective, Workplace Health and Safety Nursing has a fundamental role to perform in the elucidation of these issues emerging in miners, and in how they can be effectively managed; situations which are little-explored in the literature, and which are necessary for the construction of knowledge in Occupational Health.

This being so, the objective of this study was to investigate and discuss the miner's work conditions, the factors associated with risk of occupational exposure, and the implications of these for the work in subsurface mines.

METHODOLOGY

The research is qualitative, undertaken through the technique of thematic content analysis⁽⁴⁾, valuing the meanings, aspirations, motives, values, attitudes and beliefs of the miners from the coal-producing region of the state of Rio Grande do Sul, where the subsurface collieries – now inactive – were the base of the economy for many years.

The participants in the study were six retired miners registered in the Municipality's historical records, who undertook various activities underground, such as extraction, timbering, mechanical engineering or drilling. All identified themselves as miners, irrespective of the activity they had carried out underground.

The information was collected in 2010, through recorded semi-structured interviews, held in the miners' homes, with the following questions: What is a colliery? Can you tell me what it is like working down the mine? What

was it like for you to work in the collieries? What is it like, today, to be a retired miner?

Analysis of the data took place at three different points. Firstly, there was organization of the initial ideas from the responses of the miners to the questions put to them. Afterwards, there was exploration of the data, when the authors arrived at three thematic areas: **work conditions: *the mine...*; factors associated with risk of occupational exposure: *I worked...*; implications for the work in mines: *it would be important that...***

In relation to the ethical aspects involving research with human beings, certain cares were established in this study. The interviews were held after the Research Project had been evaluated and approved by the Research Ethics Committee of the Federal University of Rio Grande do Sul (UFRGS), under Decision nº 1744/2010. All the participants signed two copies of the Terms of Free and Informed Consent. So as to ensure the complete confidentiality of the information provided, each participant was identified by a letter of the Roman alphabet, the workers being given the opportunity to choose the letter by which they would be identified in the study.

RESULTS AND DISCUSSION

The six miners who participated in the study, all retired, were aged between 64 and 88 years old. Of these, four started working in the mines before the age of 25, one started his activities at 30, and the other at 35.

The length of time they worked there also varied. Miners A, B, C, D, E and F worked, respectively, for 18, 20, 21, 25, 14 and 12 years. It should be noted that some of them worked underground for the entire period, while others started on the surface in jobs such as saw-handling and mechanical engineering. Three witnessed the end of subsurface coalmining in the region.

Working conditions: *the mine...*

The mines were found throughout the region and were strongly associated with the city's identity, creating social representations about the world which existed around the

miners and the ways they found to face the everyday situations: a constituted knowledge which qualifies our understanding and reconstitution of the mine.

The participants reported to us an idea of the scale of the long stretches which the miners passed along underground; an arduous and intense work, undertaken with much sweat, and covered in coal, facing hours and hours of labor:

The deepest I went was 1000 meters.
(Participant A)

We walked for forty minutes from the pithead to the coal face, and that was walking fast.
(Participant F)

The shoring-up of the mine's roofs and walls was something usual:

We did the safety ourselves, the timbermen came down, we helped each other, but when it was going to fall in, you couldn't stop it.
(Participant C)

The underground mines involved restricted spaces, and there was equipment and heavy machinery, the presence of electricity and humidity. The walls and roof were liable to cave in at any moment. There were inadequate conditions for safe work⁽⁵⁾, worsened by maladjustments in the work organization and practices, materials being unavailable, and the failure to adopt preventive measures on the part of the employers and the workers themselves.

The timbermen, the drillers, the shotfirers, the mechanical engineers, the drivers of the trucks which store and transport the coal, those whose who extracted the coal with picks or shovels, the winch operators who raised the elevators, were all united in teams there. The miners were aware of the superiors' responsibility:

One day, when I arrived at my gallery, I saw that everything was coming apart, really ready to fall in. I was the foreman and I had an assistant. I told the assistant that I wasn't going to go in, and that he wasn't either. Then we went to the boss. He simply told us that the other shift was working. I answered that we weren't going to go in, and that they should call the timbermen to make the area safe
(Participant F)

Positive changes were valued as initiatives by the miners, who depended on them to keep alive while extracting minerals.

Each engineer who arrived made an improvement in the galleries where we worked, or did what was needed. (Participant E)

In the event of an accident, we called the engineer. In the meeting, they asked us to be careful. (Participant F)

In order to keep the mine a safe and healthy place to work, they had recourse to the Internal Accident Prevention Committee (CIPA)...

I went there and told the CIPA guy what was going on, that they wanted to make me go where it wasn't safe. He went with me to have a look, called the guy in charge and said that nobody was to enter that gallery until it had been made safe. (Participant F)

CIPA's objective is to observe and report the risk conditions in work environments and request measures to reduce the existing risks until they are eliminated, and/or to neutralize them. In this way, its mission is to preserve the miners' health and physical and mental integrity, as established by the regulatory norms NR 5⁽⁶⁾ and NR 22⁽⁷⁾, indicating that the work, the base of the social organization and a fundamental human right, should be undertaken in conditions which contribute to the improvement of the workers' quality of life and their personal and social realization⁽⁸⁾.

When this study's participants were working as miners, Regulatory Norm NR22, which deals with Occupational Health and Safety in Mining⁽⁷⁾ had not yet been approved. However, many of the measures stipulated by this legislation had been adopted in the work underground, such as the interruption of all activity exposing the workers to serious risks to their health and safety, even if, sometimes, this interruption was the result of positions taken by the miners themselves.

There was an urgent need to make the companies guarantee minimum working conditions so that the miners could exercise their activities with safety, as accidents and deaths were becoming common in the mining sector. For example, the vertical transport in the mines should occur in cabins or cages

which are kept closed during the transport, and with a system for communicating with the winch operator in the entry and exit points⁽⁷⁾. The requirement to have a winch operator was complied with, but the cages were not kept closed during the transport.

They filled the cage with people, and it was only closed on two sides, the other two were open. (Participant F)

People were transported along with the materials, which was slowly improved:

We went down in the elevators with and without coal. In the end, going up with the loads of coal was prohibited. (Participant D)

When the tolerance limit for mineral dust is passed, measures for reducing or neutralizing its effects must be adopted, such as the provision of masks and the use of water throughout the mine. The air must also be renewed via ventilation systems, ensuring a temperature and humidity which are appropriate to the work⁽⁷⁾. This, however, did not happen:

The ventilation didn't get to the gallery. There were places where there was so much smoke that it took more than one shift to disperse [...] You didn't wait all that time to get back to work and dig out the coal. (Participant A)

When it was really hot, the ventilation was very bad. This really took it out of us. (Participant E)

Lighting underground was restricted, initially, to carbide lamps, nowadays prohibited, and, later, to lamps running off batteries.

In the beginning, I didn't have an electric lamp, I used to use a carbide lamp hanging from my arm, and I worked with it there on my arm. In the gallery it was easier, as I could hang the carbide lamp up so that I could see the material and the wagon cables. (Participant A)

The use of individual electric lamps in accessing and working in the subsurface mines is mandatory⁽⁷⁾. As can be seen, some of the specifications of the work safety legislation were normal practice in the subsurface mines before being made law. Others, however, as they were neither practised nor regulated,

exposed the miners to environmental risks and work overload.

The subsurface mines in the coal-producing region of Rio Grande do Sul were gradually closed for extraction purposes.

People didn't know what to do. They only knew that profession down the mine, and the mines were going to close. (Participant A)

The company began to sell things off, and then it stopped. (Participant B)

There were four shifts of workers, then there were three, then two, until it finished. (Participant E)

And indeed, the increasing unemployment and the daily drama of the struggle for survival exposed the miners to situations of vulnerability and to the development of strategies related to work so that they could carry on working.

Factors associated with the risk of occupational exposure: *I worked...*

In describing the work, the miners made clear how the work practices and organization caused suffering, subjectivities arising from facing the risks down the collieries, care with the body, and illnesses and accidents experienced at work. The heavy, manual nature of the work is emphasized, which was not only physical, but emotional, which used strength and strained abilities⁽³⁾. The management of the work is conditioned by various factors, such as organizational issues, individuals' characteristics, and the environmental conditions in which mine work is carried out⁽⁹⁾.

For all the miners, the exposure to danger was constant: detonation of explosives; heavy machinery; poisonous gases; need for shoring up of the walls and roofs in the mines, revealing knowledge of the precarious conditions of safety and work, with consequences for their health.

Your body hits here, hits there, you have to be taking care of yourself as to whether the roof isn't dangerous, if it's not going to fall in. (Participant A)

I ate in the mine, in real filth. I washed my hands, but they were still dirty with coal. (Participant F)

The blast and explosives to break up the coal raised horrible dust. (Participant F)

It was unusual not to feel pain or have back problems, but you didn't say anything so as not to run the risk of losing your job. (Participant E)

Coal dust particles in which silica is present can be deposited in the upper and lower airways, causing occupational illnesses such as pneumoconiosis or the development of chronic obstructive pulmonary disease or emphysema⁽¹¹⁾. In mining, the evaluation of the environmental conditions is a fundamental factor in supporting measures which are aimed at health and the avoidance of illnesses and accidents⁽²⁾.

For the miner, mutilating or fatal accidents were close, when he himself was not a victim.

At that time, a lot of people died, too! (Participant D)

Four men died because they made a mistake. The smoke came from one side and they went into the wrong gallery, lit the wicks on their lamps, set off an explosion in the mine and were blasted by the fire. They died. I got a fractured skull. I was in hospital for 26 days. (Participant E)

I stopped work because I had an accident. (Participant F)

Accidents cause strain, are traumatic for the worker, and expose the whole group to similar risks. Nothing is more treacherous than death resulting from a work accident. There can be no doubt that this is an enormous load for the miner, his family, the company, the health services and the social security service. At the present time, the Brazilian intervention programs for confronting this problem are generally based on health surveillance and safety models, applied through different strategies, such as inspections, penalties, and staff development, the aim being to promote improvement of companies' performance in the practice of protecting the workforce⁽¹⁰⁾.

Preventing accidents and preserving life required the miners to be constantly attent to small details:

You knew when a gallery was close to caving in. (Participant D)

If you saw it was dangerous, you didn't carry on. You called the boss and asked for props. You got the place beamed and propped, and only then did you dig. (Participant C)

The foremen, sometimes, told us to enter the galleries at risk of cave-ins, but we knew what that meant. (Participant D)

To protect themselves below ground, the miners had personal and collective protective equipment. However, not all the workers used it regularly, which represents lack of best guidance regarding the importance of its use. The workers, then, did not feel affected at that time.

I protected myself with a helmet. (Participant A)

Down there, there was a mask to wear because of the dust, some used it and others didn't. They didn't believe they were throwing away their health. (Participant D)

Although the prevention of risks and accidents in work carried out in subsurface mines is fundamental for the exercising of the activity, for the miners, a hypothetical falling-ill belonged to the future.

To obtain genuine protection, it was fundamental to establish ways to minimize the danger, the strain and the exhaustion which the body suffered at work, even if these were rudimentary:

With all that, you had to take care: humidity; electrical wiring; the wagon. If something went wrong, there would be a tragedy for sure. (Participant A)

The wagons were pulled by cables and when they derailed they had to be switched off. It was very dangerous to deal with electricity in that humidity, that's why I started working in rubber boots, which I spent my own money on. (Participant A)

We started taking water with ice, in little thermos flasks. We drank cool water all the way through the shift. That helped. I didn't dehydrate anymore and I didn't get any more boils. (Participant E)

When you worked, you sweated, it ran down you. We had to make holes in our rubber boots

with hot nails, otherwise they filled up with sweat and you had to take them off to pour it out. (Participant F)

It wasn't always easy to care for the body; this required the miners to consider themselves and their limits and weak points⁽³⁾. Held as brave men, who penetrate the darkness of the galleries to prise coal from the earth, the sustenance of their families⁽¹¹⁾, it required the miners to make changes in order to preserve their health.

So that their food wouldn't have contact with the rodents and insects which co-existed with the workers underground, there was an alternative:

We'd get a long rope or a fuse to hang the bags with the food up high, on the props which shored up the mine, so the rats and the cockroaches wouldn't get it. (Participant F)

When a subject understands his role, this helps him to take a position in the face of the situations which arise. He acquires more confidence and develops a better concept of himself. A conflict of roles occurs when the individual is required to undertake an activity which is not in accordance with his values, or when differing activities are incompatible⁽¹²⁾. In this regard, miners often submitted to danger because they lacked other options for making a living. The work paid, which, paradoxically, resulted in overload of activities and stress⁽¹⁾:

The salary 'up there' was little more than one minimum salaryⁱ. Down the mine, I made up to up to six or seven salaries. (Participant C)

They didn't take care of themselves, they wanted to produce more and earn more. This greed for money did a lot of harm. (Participant F)

Because the earnings of the miners who extracted the coal were linked to their productivity, that is, the amount of coal removed from the galleries, the danger, the

work conditions and the care taken were often relegated to second place.

People have a tendency to adopt an attitude to capital which is submissive, and one's labor is seen as a product. The majority does not analyze, criticise or discuss the issue and seems to have no decision-making power over the world in which they work, even if this is because the need to survive does not always give them the option of choice⁽¹⁾.

There wasn't better work, there wasn't another opportunity for work, apart from being a miner - there wasn't another choice. If you wanted a different job, you had to move to another city. (Participant A)

In reflecting on this situation, one may observe an important contradiction in the world of work, present in those days and which persists until now: while part of the working class is penalized with the lack of work, the dominant class legitimizes the evident subordination, a status quo supported by economic interests and moral values which go back far in time⁽¹³⁾.

Implications for the work in mines: it would be important to...

In the miners' accounts, mention was not found of the adoption of a Worker's Health policy with definition of tasks and competences able to guide actions considering the dynamic and the constant transformations which were processed in their world of work.

However, as retired miners, they recognise that the work in the mines was important and hold it as a life experience:

I'm not sick, like many who I see. (Participant A)

If I were younger, healthier, I would want to go back to work in the mine. For me it was a good experience. (Participant C)

It is the stupidest job I've ever seen in my whole life. Down the mine you're nothing more than an animal. (Participant F)

Due to their experiences in such extreme working conditions, in which they might at any moment witness or suffer fatal, disabling

ⁱAt the time of writing (September 2013) the minimum salary in Rio Grande do Sul is R\$770, worth about US\$323. Translator's note.

or mutilating accidents, the miners developed ways of coping with such difficulties. They laugh at their problems and, through joking, manage to distance the center of their 'I' from the problematic situation experienced. The humor supports the group identity, and the creativity involved in this humor is that of subjects who have got through serious, traumatic contexts, yet who separate themselves from the trauma experienced by overcoming it based on the suffering in the face of danger⁽¹⁴⁾.

The conditions which impact on the work in mines point to the need to consider a policy of valuing health and safety at work with the participation of the Workplace Health and Safety Nurse⁽¹⁵⁾, as well as transferring – from miners' pay – income to Occupational Health programs, retirement funds and pensions, in relation both to the budget foreseen for investment, and to the funding and payment of social security⁽¹⁶⁾. It is these workers' lives.

The practices related to Worker's Health, in the present study, are shown to be within the hegemony of Occupational Health, a concept of illness which was limited to what was produced by illnesses or accidents from work. The specific risks were not even reported by the miners as informing preventive actions, however, they mentioned some actions resulting from the consequences produced by them – or, simply, eliminating them. Therefore, fertile ground is found for the participation of the Workplace Health and Safety Nurse in the promotion of health and in the prevention of risks to health, regarding illnesses and accidents at work in the mining sector.

FINAL CONSIDERATIONS

It is fundamental for research undertaken in the area of Workplace Health and Safety Nursing to increasingly deepen work processes in Occupational Health in different areas of coverage, outline, and characteristics, with a view to obtaining distinct forms of knowledge production in the plane of organizational practice and guidance for action, such that tragic repercussions such as those reported in media worldwide, such that those which

occurred recently in Chile, China, Colombia and New Zealand may be minimized, if not eliminated.

Work in Worker's Health in high-risk environments must have a greater presence, and for that to happen requires knowledge and understanding of how these workers face the heavy and exhausting daily routine. Over the years, in the work undertaken by the miners, preventing illness or even stopping certain cumulative and progressive illnesses, as yet imperceptible, from becoming worse or from manifesting during retirement, has occurred in an incipient form. This perspective reveals how important it has been to adopt investing in the prevention of occupational illnesses and accidents, as, more than keeping an attentive eye on illness and its consequences, it is necessary for Occupational Health professionals, especially the Workplace Health and Safety Nurse, to act proactively, readily taking on the tasks of encouraging new forms of care and health.

This study sees the confrontation of adverse conditions as realizations of productive life, making it possible to recognise its importance for Health at Work. It may be observed that there is positive space for re-standardizing this process by the workers, considering the mode of organization and practices for confronting environmental risks and the care for the body to benefit life.

It is urgent to broaden the field of research of the Workplace Health and Safety Nurse, not limiting it to the more known aspects of the world of work, so as to fill the gaps in the Policies of Attention to Workers' Health, in the public ambit as in the private, in the individual ambit as in the collective. The undertaking of further research and the extending of existing studies on mining work is of extreme importance for the workers and for Workplace Health and Safety Nursing, so as to minimize the harm done to these workers' health.

Recognition, moreover, is due to the retired miners for their life histories, which are part of the history of the coal-producing region of the state of Rio Grande do Sul and of Brazil.

TRABALHO NOS SUBTERRÂNEOS, MINEIROS COM A PALAVRA - CENÁRIO DE PREOCUPAÇÕES PARA A ENFERMAGEM DO TRABALHO

RESUMO

As condições de trabalho em minas subterrâneas são extremas, o mineiro está sujeito, a todo o momento, a presenciar ou sofrer acidentes fatais, incapacitantes ou mutiladores. Estudo descritivo exploratório de abordagem qualitativa que visa conhecer e discutir as condições de trabalho do mineiro, os fatores associados ao risco de exposição laboral e as suas implicações para o trabalho em minas subterrâneas. A coleta dos dados deu-se em 2010, com seis mineiros aposentados que aceitaram participar do estudo, previamente aprovado por Comitê de Ética em Pesquisa. Do *corpus* da análise de conteúdo despontaram três categorias temáticas: condições de trabalho: *a mina...*; fatores associados ao risco de exposição laboral: *trabalhei...*; implicações para o trabalho em minas: *seria importante que...* Os enfrentamentos aos riscos ambientais, cuidado com o corpo e adoecimentos e acidentes revelam que o modo de organização e práticas do trabalho gera sofrimento para o mineiro. A questão da saúde do trabalhador ultrapassa a técnica e requer a atuação de profissionais, como o Enfermeiro do Trabalho, para promover a saúde.

Palavras-chave: Enfermagem do trabalho. Riscos ambientais. Saúde do trabalhador. Minas subterrâneas. Trabalhadores.

TRABAJO SUBTERRÁNEO, MINEROS CON LA PALABRA – ESCENARIO DE PREOCCUPACIONES PARA LA ENFERMERÍA DEL TRABAJO

RESUMEN

Las condiciones de trabajo son extremas en las minas subterráneas y se está sujeto a presenciar o sufrir accidentes fatales, incapacitantes o mutiladores. Estudio descriptivo exploratorio de abordaje cualitativo que busca conocer y discutir el trabajo del minero, los factores asociados al riesgo de la exposición laboral y sus implicaciones en el trabajo en las minas subterráneas. Los datos se obtuvieron en 2010 con seis mineros jubilados que aceptaron participar en el estudio, previamente aprobados por el Comité de Ética de Investigación. El corpus de análisis de contenido emergieron tres temas: las condiciones de trabajo: una mina ...; los factores asociados con el riesgo de exposición ocupacional: Se teje ...; implicaciones para el trabajo en las minas: es importante que ... La exposición a riesgos medioambientales, el cuidado del cuerpo, las enfermedades y los accidentes revelan que el modo de organización y prácticas laborales generan sufrimiento. La cuestión de la salud del trabajador va más allá de la técnica y requiere la actuación de profesionales, como el enfermero de trabajo, para promover la salud.

Palabras clave: Enfermería del trabajo. Riesgos ambientales. Salud laboral. Minas subterráneas. Trabajadores.

REFERENCES

1. Azambuja EP, Fernandes GFM, Kerber NPC, Silveira RS, Silva AL, Gonçalves LHT, et al. Significados do trabalho no processo de viver de trabalhadoras de um Programa de Saúde da Família. Texto & contexto enferm. 2007; 16 (1):71-9.
2. Instituto Brasileiro de Mineração (BR). Informações e Análises da Economia Mineral Brasileira. 6ª. ed. Brasília (DF): 2011.
3. Sartor DGB. A saúde dos trabalhadores das minas de carvão da região carbonífera de Criciúma: uma abordagem qualitativa. Em Debate: Rev Dig. [on-line]. 2010; 4:24-41 [citado 2013 jun 18]. Disponível em: <http://www.periodicos.ufsc.br/index.php/emdebate/article/view/1980-3532.2010n4p24>
4. Minayo MCS. Pesquisa Social: teoria, método e criatividade. 29ª. ed. Petrópolis(RJ): Vozes, 2010.
5. Marziale MHP, Jesus LC. Modelos explicativos e de intervenção na promoção da saúde do trabalhador. Acta Paul Enferm. 2008; 21(4):654-9.
- 6 Ministério do Trabalho e Emprego (BR). Portaria GM n.º 3.214, de 08 de junho de 1978: institui a Norma Regulamentadora nº 5 - Comissão Interna de Prevenção de Acidentes. Brasília (DF); 1978.
7. Ministério do Trabalho e Emprego (BR). Portaria GM n.º 3.214, de 08 de junho de 1978: institui a Norma Regulamentadora nº 22 - Segurança e Saúde Ocupacional na Mineração. Brasília (DF); 1999.
8. Presidência da República (BR). Portaria nº 7.602/GM, de 07 de novembro de 2011: dispõe sobre a Política Nacional de Segurança e Saúde do Trabalhador (PNSST). Brasília (DF): MS; 2011.
9. Cerdeira JPC. Ambiente térmico na atividade mineira subterrânea. [dissertação]. Porto(PT): Faculdade de Engenharia da Universidade do Porto; 2012.
10. Chaves SCL. Determinantes da implantação de um programa de segurança e saúde no trabalho. Rev Panam Salud Publica. 2009; 25(3):204-12.
11. Nascimento D, Bitencourt JB. De granito e de bronze marcos da identidade carbonífera em cidades catarinenses. Varia Hist. 2008; 24 (39):329-43.
12. Camelo SHH, Angerami ELS. Riscos psicossociais no trabalho que podem levar ao estresse: uma análise da literatura. Ciênc cuid saúde. 2008; 7 (2):232-40.
13. Merlo ARC, Mendes AMB. Perspectivas do uso da psicodinâmica do trabalho no Brasil: teoria, pesquisa e ação. Cad psicol soc trab. 2009; 12 (2):141-56.

14. Laranjeira CASJ. Do vulnerável ser ao resiliente envelhecer: revisão de literatura. *Psic: Teor e Pesq.* 2007; 23 (3):327-32.

15. Bobroff MMC, Martins JT. Aspectos ético-legais da equipe de enfermagem em saúde do trabalhador:

reflexões necessárias. *Ciênc cuid saúde.* 2011; 10 (3):608-13.

16. Dedecca CS, Rosandiski EM, Barbieri CV, Jungbluth A. Salário mínimo, benefício previdenciário e as famílias de baixa renda. *Rev Bras Est Pop.* 2006; 23 (2):317-29.

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