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Social situation and hospitalisation due to chronic conditions

Lucy Bayer-Oglesby, Nicole Bachmann, Andrea Zumbrunn



Schweizerisches Gesundheitsobservatorium
Observatoire suisse de la santé
Osservatorio svizzero della salute
Swiss Health Observatory

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Summary

As part of the NRP 74 project “Social Inequalities and Hospitalisations in Switzerland” (SIHOS), a database was created for a representative random sample of the Swiss population that includes demographic and socio-economic variables as well as characteristics of hospital admissions. To create the database, national health and social data from the Federal Statistical Office (FSO) were anonymised through hashing and combined by means of the generated anonymous linkage code.

Using this new database this study shows for the first time, that in Switzerland certain social groups have an increased risk of being admitted to hospital due to chronic conditions. Those affected are persons with a low education level, limited social resources and a lack of labour market integration. As the SIHOS database contains no information on health behaviour or people’s state of health prior to hospital admission, to a certain degree the results also reflect differences in health behaviour (e.g. smoking) and in the incidence or prevalence of specific chronic diseases in the social groups studied. Of particular interest, therefore, is the question of whether the impact of social status varies according to the disease and also whether other social characteristics, depending on the disease, have an influence on the risk of having to be treated in hospital.

The steepest *education gradients* are observed for diabetes, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD) and asthma (known as *ambulatory care sensitive conditions*, i.e. diseases for which hospitalisations can be avoided through appropriate outpatient care), as well as for lung cancer and mental disorders. The risk of hospitalisation due to one of these diseases is two to three times greater for a person with no post-compulsory education than it is for a person with tertiary education, even when age, sex, nationality and survey year are taken into account. The indicator for *limited social resources*, i.e. “Living alone”, is associated with an increased risk of hospitalisation for the same diseases. The greatest impact is seen on hospitalisations due to mental disorders. With reference to *labour market integration*, people looking for work and those who are not employed are also at a sometimes massively increased risk of hospitalisation due to mental disorders. Among the somatic diseases, the fact of not being economically active results in the steepest gradient for those diseases that can lead to considerable functional limitations, such as COPD and back problems.

Because the somatic diseases examined here usually take a long time to develop and tend to appear in the second half of life (e.g. COPD), it can be assumed that the education and training

completed in young adult life has an influence on the risk of falling ill.

As far as mental disorders are concerned, however, their early appearance can hamper the achievement of vocational or higher education qualifications. In terms of education, therefore, a reverse causality is conceivable. The same holds true for labour market integration, as a mental disorder is proven to make it harder to find a job and to stay in the labour market. Causality in either direction is possible regarding the relationship between limited social resources and mental disorders. Loneliness may trigger or worsen a depressive mood, but conversely, mental disorders can also lead to the breaking off of social contacts.

Overall, the unequal social distribution observed in hospitalisation risks is probably the result of an accumulation of several factors in a chain of processes over many years. Among others, these include the socially unequal exposure to risk factors, social differences in the availability of resources to cope with chronic conditions, as well as barriers to the utilisation of appropriate health care services. The SIHOS study cannot assess the contribution of each individual factor to the end result i.e. the need for hospitalisation:

However, the breakdown of findings by social indicator and specific disease enable the following starting points to be defined for reducing the observed social differences in the risks of hospitalisation:

- Greater focus on socially disadvantaged groups in behavioural and structural prevention.
- Outpatient, patient-centred forms of care that meet the needs of the groups concerned and are used by them.
- Greater consideration given to consultation time in the tariff system, to meet the increased need for discussion between health specialists and patients.
- Closer intertwining between health and social care to facilitate the coordination of medical care and informal as well as professional social support.
- Offers of professional (re)integration that meet the needs of the groups concerned as well as a resource-enhancing approach to job seekers on the part of social insurance authorities, social welfare and society.

1 Introduction

The importance of social determinants for the health opportunities of the Swiss population is well researched and documented. There is a clear educational gradient in terms of health behaviour, the burden of disease and mortality (Obsan, 2015). The impact of social resources on health is also well known. For example, good social integration and social support reduce the risk of cardiovascular diseases (Bachmann, 2014; Obsan, 2015). For the working age population, several studies provide evidence of the association between labour market integration on the one hand and disease risks and mortality on the other (Bachmann, 2014; Obsan, 2015).

There is also evidence of social differences in the use of outpatient medical services in Switzerland: Those who completed only compulsory education are more likely to consult general practitioners compared to those with tertiary education, whereas they are more likely to forego visiting a specialist or dentist. Moreover, they are less likely to undergo early screening tests (Federal Statistical Office, 2017).

By contrast, there is a gap in knowledge in Switzerland about the social determinants of utilisation of inpatient care. International studies show that individuals with low socioeconomic status (Frølich et al., 2019; Wallar & Rosella, 2020) and those with limited social support (Hu et al., 2019; Pimouguet et al., 2016) are also at increased risk of being hospitalised due to chronic diseases.

The study "Social Inequalities and Hospitalisations in Switzerland" (SIHOS, see Section 2 Methodology) combined for the first time in Switzerland national inpatient data with national census data in anonymised form. Using analyses of the SIHOS database (see Section 2 Methodology), this Obsan report addresses the following question:

Is there an association in Switzerland between a person's educational attainment, social resources and labour market integration and the risk of hospitalisation due to chronic diseases?

The focus of these analyses is on non-communicable chronic diseases (NCD), which accounted for 80 per cent of total healthcare costs in Switzerland in 2011 (Wieser et al., 2014). Chronic diseases are characterised by extended phases of disease and pose major challenges for those affected, their families and the healthcare system.

Some somatic NCDs, such as lung cancer, heart failure and COPD, share common risk factors such as smoking, poor nutrition and insufficient physical activity, while these risk behaviours

are also influenced by social determinants. Successful treatment of many NCD diseases, e.g. diabetes, congestive heart failure and COPD, requires a high degree of treatment compliance and self-management by those affected (Burkert Nathali et al., 2014; Wallar & Rosella, 2020). Managing chronic diseases is therefore seen as a collaboration between the affected individuals and the professionals, which takes place first and foremost in patients' everyday lives. A relationship of trust between the doctor and the person with the condition that takes into account the individual situation of the person concerned is a prerequisite for successful collaboration (Bachmann, 2015; Haslbeck et al., 2015). In the case of diabetes, congestive heart failure, COPD and asthma, which are also referred to as Ambulatory Care-Sensitive Conditions (ACS), hospital stays resulting from an acute deterioration in health can often be avoided with effective ambulatory care, patient compliance and self-management. However, socially disadvantaged groups, who are more frequently affected by these diseases, often have few resources, e.g. those required to implement the necessary lifestyle changes and to organise the necessary support.

In the case of mental disorders such as depression in particular, social gradients of the burden of disease (Obsan, 2015) are accompanied by social differences in willingness and ability to take advantage of effective outpatient services at an early stage, which could prevent a worsening of the disease and the necessity of a hospital stay (Baer et al., 2013).

2 Methodology

Project SIHOS

The project “Social Inequalities and Hospitalisations (SIHOS)” is part of the National Research Programme 74 “Smarter Health Care”. The NRP 74 is promotes innovative health services research that will help to tackle the practical challenges of caring for the chronically ill in Switzerland (see <http://www.nfp74.ch/de>, accessed on 05.11.2020).

The SIHOS project focuses on the care of socially disadvantaged patient groups with chronic diseases within inpatient care structures and examines, among other things, the relationship between social factors and the length of inpatient stays, the multimorbidity of inpatients, the discharge destination, the risk of unplanned readmission and the 30-day post-discharge mortality rate. Additional analyses focus, for example, on social differences in the inpatient treatment of back problems.

The results of the statistical analyses are discussed and qualitatively consolidated in focus groups with patients and professionals from the fields of medicine, migration and social welfare. Approaches are developed to improve the quality of care for socially disadvantaged groups. The study also lays the groundwork for the future monitoring of socioeconomic and social factors in healthcare.

The project is being implemented by the Institute for Social Work and Health, FHNW School of Social Work in cooperation with Obsan, the Bern University of Applied Sciences (BFH) and the Swiss Tropical and Public Health Institute (SwissTPH), (see <http://www.nfp74.ch/de/projekte/stationaere-versorgung/projekt-bayer-oglesby>, accessed on 05.11.2020).

SIHOS database

Thanks to the partial revision of the Ordinance on the Collection of Statistics (2014), data from different surveys can now be combined and analysed in Switzerland. For a representative sample of the Swiss population, a database was created that includes demographic and socioeconomic variables as well as information on hospital stays and stays in nursing homes in Switzerland. This data was then linked to information about mortality, resulting in a database unique in Switzerland that allows analysis of the associations between social situations, hospitalisations and health outcomes in inpatient settings. The size of the SIHOS samples makes it possible to perform analyses with specific chronic conditions and rather small vulnerable groups.

The national health and social data collected by the Federal Statistical Office (FSO) were anonymised by the FSO using a hashing procedure. Using the anonymous linkage code, 1.2 million records from the Structural Survey (SS 2010–2014) were combined with 9.6 million records from the Hospital Medical Statistics (MS 2010–2016), 1.0 million records from the Statistics on Social Medical Institutions (SOMED 2010–2016), 0.4 million mortality records from the Swiss Vital Statistics (BEVNAT 2011–2016) and 1.0 million house-moving records from the Population and Household Statistics (STATPOP movements 2011–2016).

Limitations of the SIHOS database

The database underwent comprehensive validation and the matched records were evaluated for completeness and correctness. The conclusion of the validation is that the absolute hospitalisation rates of the SS-participants as calculated using the SIHOS database are around 35% lower than the actual rates observed in the Swiss population. It was demonstrated that the following three factors contributed to this discrepancy: (1) Incorrectly generated anonymous linkage codes (underestimation of 30%), (2) under-representation of individuals with health problems in the SS sample and (3) demographic deviations of the SS sample from the reference population. However, the comprehensive evaluation of the database revealed no evidence that the incorrect linkage codes introduced any bias with regard to the relevant social factors in the SIHOS database, with the exception of under-representing non-European migration groups.

The linkage problems that occurred should therefore have had very little impact on the results presented here (age progression of hospitalisation risks by NCD disease groups and by educational attainment, relative hospitalisation risks by educational attainment, household type and labour market integration). Nonetheless, reliable anonymous linkage codes for national health statistics should be developed in the near future to ensure a valid data basis from the start for future data linkage projects.

Indicators of social situation

As indicator for *educational attainment* the SIHOS database includes the highest educational qualification achieved. This is a meaningful value from around the age of 25 upwards (Federal Statistical Office, 2014). In the SIHOS population cohort (25–84

years), 21% have no more than compulsory education or no educational qualifications, 48% have an upper secondary level qualification and 31% have a tertiary level qualification. Educational attainment is a classic indicator of vertical social inequality and displays a strong and consistent relationship with the population's health opportunities and risks of disease and mortality (Marmot et al., 2012; Obsan, 2015).

The SIHOS database contains the variable household type as an indicator for a person's *social resources*. People who live alone in a household have a demonstrably higher risk of receiving less social support and feeling lonelier than people who live with others (Bachmann, 2014). In the SIHOS population cohort (25–84 years) 22% live in a one-person household and 78% in a multi-person household. Living alone does not preclude a person from having a large, strong social network. Nonetheless, there is a lack of immediate, everyday support in the event of health problems or crisis situations that people living in the same household can provide. The impact of social resources on health has been established. Good social integration and social support reduce the risks of cardiovascular diseases, cancer and infections in particular. Social support can trigger or impact on biological processes by influencing behaviour and emotions (Bachmann, 2014). Mental disorders in particular can give rise to social withdrawal or increasing isolation (Bachmann, 2014).

The SIHOS database uses *employment status* as an indicator of labour market integration. In the SIHOS working age population cohort (25–64 years) 81.1% work full- or part-time, 15.3% are economically inactive and 3.6% are unemployed and looking for work according to the definitions of the International Labour Office (ILO). According to the ILO definition, all individuals in the permanent resident population of Switzerland who are without work, are actively looking for work and were available for work count as unemployed. Various studies show an association between labour market integration and health opportunities in the working-age population. Employed persons are generally in better health compared to the economically inactive or unemployed (Bachmann et al., 2015). Persons registered with the unemployment fund have a significantly higher risk of premature death than employed persons. (Bachmann & Neuhaus, 2010).

Chronic conditions

Hospitalisation risks are analysed separately for 16 specific NCD diseases (cf. Box 1). The diseases were selected in accordance with the following criteria: (1) Chronic condition or an acute incident of a chronic condition (e.g. a myocardial infarction), (2) frequency of the disease in Switzerland, (3) frequency of hospitalisations due to the disease in Switzerland, and (4) percentage of all deaths caused by the disease in Switzerland.

The ICD10-GM codes and the classifications according to the Clinical Classification Software (CCS Level 1) of the 16 specific diseases are listed in T 2.1.

Multivariate models

The descriptive analyses with regard to age and education do not take into account other possible factors that may impact on hospitalisation, which could partly explain the differences found. Multivariate logistic regression models were therefore developed for further analyses in order to minimise confounding of other factors (adjusted models). The models systematically control for the known effects of age, gender and nationality on the risk of being hospitalised. The year of the structural survey was included in the models to control for possible trends over time (increase or decrease in hospitalisation rates). The health behaviour and state of health of a person prior to admission are also important factors that influence the risk of hospitalisation. The structural survey does not, however, provide any information on this. To a degree, the results therefore also reflect differences in the social groups studied with regard to their health behaviour (e.g. smoking) and with regard to the incidence and prevalence of specific NCD diseases.

Odds ratio

Figures G 3.3-G 3.5 each show the adjusted odds ratios (and 95% confidence intervals) for at least one hospitalisation within two years of participation in the structural survey due to the respective specific disease (vs. no hospitalisation due to this disease) associated with educational attainment, household type and labour market integration. Examples: A person who completed only compulsory education is twice as likely to be hospitalised for lung cancer as a person with tertiary education (OR=2.0). A person who lives alone is 40% more likely to be hospitalised for lung cancer than a person living in a multi-person household (OR=1.4). A woman who completed only compulsory education has a 20% lower probability of being hospitalised for breast cancer than a woman with tertiary education (OR=0.8).

T 2.1 Definition of the specific diseases

Specific diseases	CSS Level 1*	ICD10-GM Codes (2017 version)
Chronic somatic diseases		
Malignant neoplasms (cancer)		
Lung cancer	CSS_LEV1 = 19	C34, D022
Colon cancer	CSS_LEV1 = 14	C18, D010
Breast cancer (women)	CSS_LEV1 = 24	C50, D05
Prostate cancer (men)	CSS_LEV1 = 29	C61, D075
Cardiovascular diseases (incl. risk factors)		
Diabetes	CSS_LEV1 = 49.5	E10–E14, R73
Congestive heart failure (CHF)	CSS_LEV1 = 108	I50
Acute myocardial infarction (AMI)	CSS_LEV1 = 100	I21, I22
Acute cerebrovascular diseases	CSS_LEV1 = 109	I60–I64, I66
Chronic respiratory diseases		
Chronic obstructive pulmonary disease (COPD)	CSS_LEV1 = 127	J40–J44, J47
Asthma	CSS_LEV1 = 128	J45, J46
Musculoskeletal diseases		
Osteoarthritis	CSS_LEV1 = 203	M15-M19
Back problems	CSS_LEV1 = 205	M43.2, M43.3, M43.4, M43.5, M43.6, M45, M46 (excl. M46.2, M46.3), M47, M48 (excl. M48.5), M49 (excl. M49.0, M49.5), M50, M51, M53, M54
Mental disorders		
Affective disorders	CSS_LEV1 = 69	F3, F41.2
Psychotic disorders	CSS_LEV1 = 70, 71	F2, R41.0
Alcohol-related behavioural disorders	CSS_LEV1 = 66	F10, G31.2, R78.0

*CSS = Clinical Classifications Software, developed by the Healthcare Cost and Utilisation Project (HCUP), financed by the US Agency for Healthcare Research and Quality, adapted for Switzerland by Daniel Zahnd, BFH.

3 Results

Hospitalisation risks by age and education

Figure G 3.1 shows the age progression of hospitalisation risks by NCD disease groups. Hospitalisation due to the selected types of cancer, cardiovascular diseases and respiratory diseases are comparatively rare up to the age of around 40 and increase sharply from around 45 years of age. Hospitalisations due to musculoskeletal diseases already occur more frequently from around 30 years of age. The selected mental disorders already result in hospitalisation relatively frequently during adolescence, slightly more frequently between the ages of 40 and 60 and then less frequently thereafter.

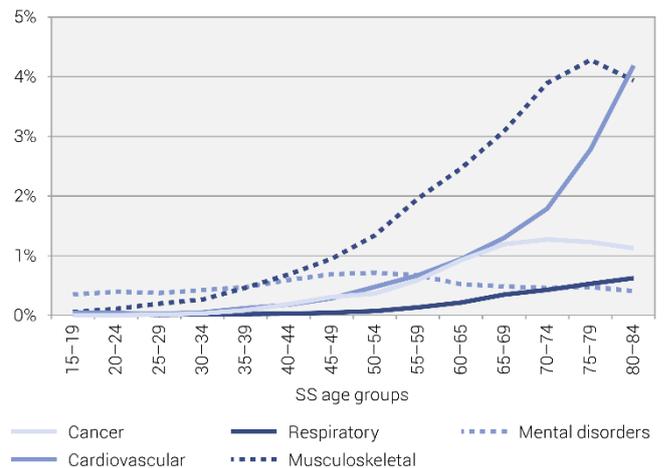
Figure G 3.2 shows the unadjusted hospitalisation risks of selected NCD diseases by educational attainment and age – i.e. not statistically controlled for the effects of other variables such as gender, nationality, etc. The risk of hospitalisation due to lung cancer, diabetes and COPD increases earlier and more steeply in the group that completed only compulsory education than among university graduates. This result points to the hypothesis that the socially disadvantaged suffer accelerated ageing, combined with the earlier development of chronic diseases and multimorbidity (Barnett et al., 2012). While premature ageing can be explained by unfavourable health behaviours, it is also consistent with the findings of recent studies that indicate a stress-induced accelerated biological ageing process, measured with epigenetic bio-markers, in socially disadvantaged individuals, regardless of their individual behaviour (Fiorito et al., 2017).

In the case of colon cancer and acute stroke, there is little difference between those with differing educational levels up to around the age of retirement, but an inverse gradient for the former and a tendency to an inverse gradient for the latter are observed thereafter.

The picture for psychoses is very different. The risk of hospitalisation is particularly high among young people, with a particularly pronounced social gradient in this age group. This result can to some extent be explained by a reverse direction of causality

between health and socioeconomic status: psychoses occurring at an early age can have a clearly detrimental effect on educational ability (OECD, 2014). The SIHOS database underestimates the absolute hospitalisation rates shown in Figures G 3.1 and G 3.2 by around 30% because of erroneous anonymous linkage codes (see Section 2 Methodology), but this is rather unlikely to have an impact on differences in age progression by NCD disease group and by educational attainment.

Hospitalisation rates (in %) for NCD disease groups by five-year age groups G3.1



N=1,184,616

Hospitalisation within two years of participation in the structural survey. Hospitalisation rates calculated on the basis of the SIHOS database are underestimated by around 30% due to erroneous anonymous linkage codes, but the relative age progressions by disease group should still be conclusive (see Section 2 Methodology).

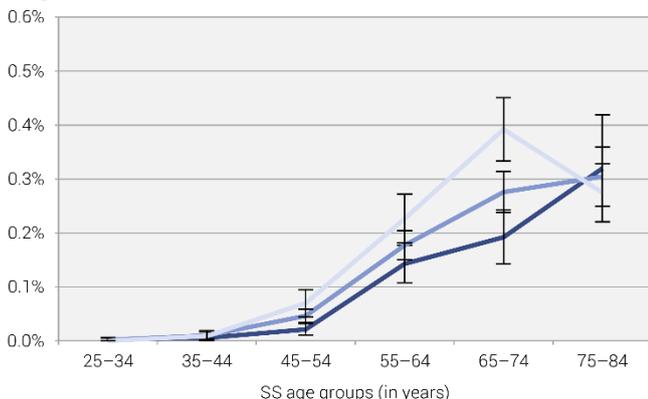
Source: SIHOS population cohort, age 15–84, SS 2010–2014 and MS 2011–2016

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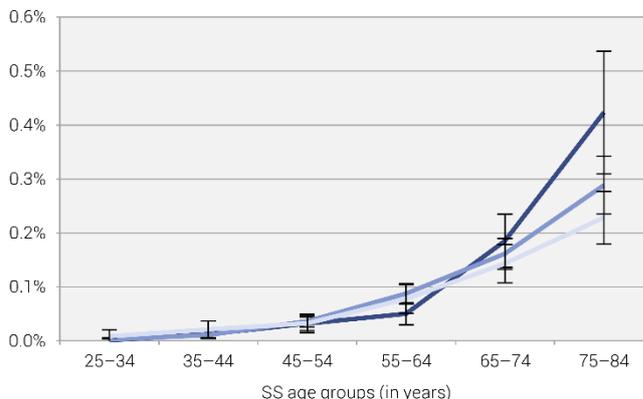
Hospitalisation rates (in %) by age and educational attainment

G3.2

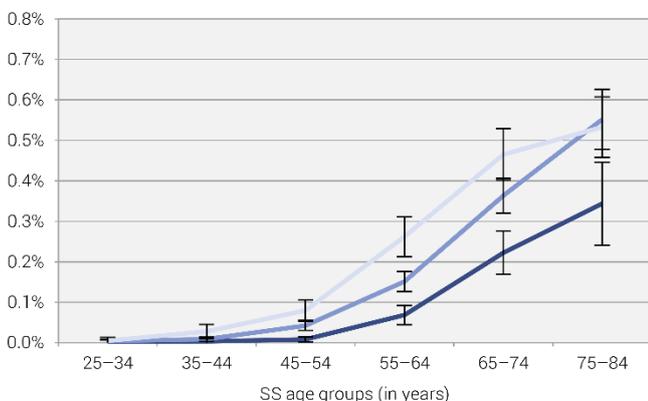
Lung cancer



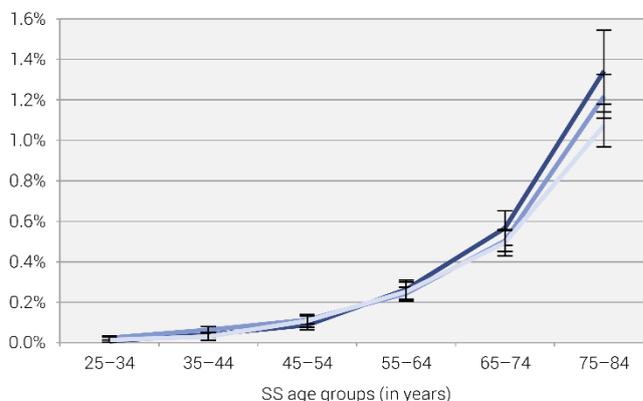
Colon cancer



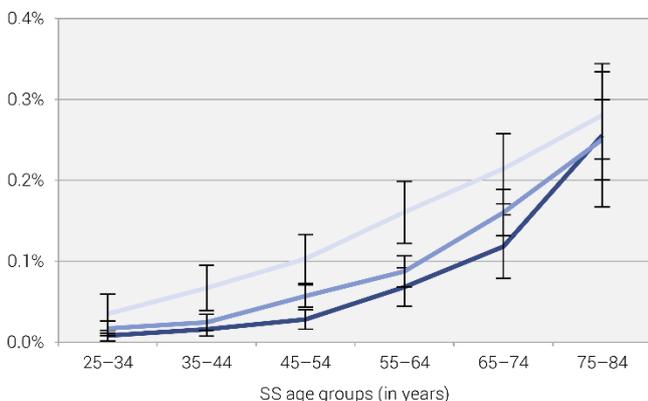
COPD



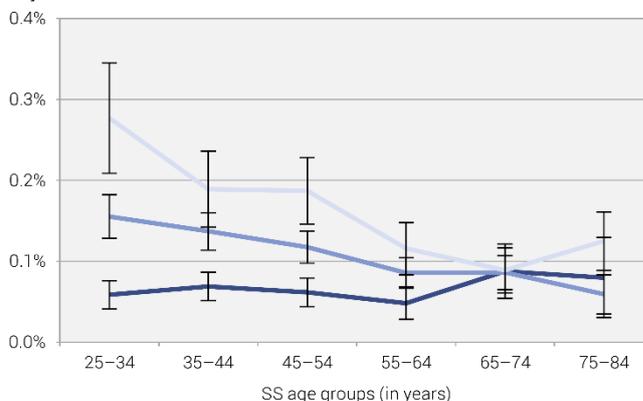
Stroke



Diabetes



Psychotic disorder



— Compulsory education **I** Confidence interval (95%)
— Upper secondary level
— Tertiary level

N=1,042,808

Hospitalisation within two years of participation in the structural survey. 95% confidence intervals are indicated. Hospitalisation rates calculated on the basis of the SIH-IOS database are underestimated by about 30% due to erroneous anonymous linkage codes, but the relative age progressions by educational attainment should still be conclusive (see Section 2 Methodology).

Source: SIHOS population cohort, age 25–84, SS 2010–2014 and MS 2011–2016

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Box 1: Specific chronic diseases and social situation (current state of research)

Cancer

The most common types of cancer in Switzerland were analysed. For women these are *breast cancer*, *colon cancer* and *lung cancer*; for men *prostate cancer*, *lung cancer* and *colon cancer*. Compared to other types of cancer, these cancers also have the highest mortality rates (Federal Statistical Office, 2019). The incidence of lung cancer shows a very strong social gradient (Tweed et al., 2018), which can be explained by the known association between smoking and socioeconomic status. The incidence of colon cancer shows a weak social gradient (Tweed et al., 2018). Non-modifiable factors such as age and family history are the main characteristics that increase the risk of disease, but this risk can be reduced by a healthy lifestyle (Krebsliga, 2014). Breast cancer shows a weak, inverse social gradient: Women with tertiary education have a slightly higher risk of developing the disease, which can be explained by reproductive factors – later age at birth of first child and fewer births (Lundqvist et al., 2016; Tweed et al., 2018). The known risk factors of prostate cancer, age and hereditary predisposition, cannot be changed. A weak inverse gradient is observed in its incidence (Tweed et al., 2018).

Diabetes and cardiovascular diseases

Cardiovascular diseases are the leading cause of death in women and second only to cancer in men (Federal Statistical Office, 2019). *Diabetes* (a risk factor for cardiovascular disease), *congestive heart failure*, *acute myocardial infarction* and *stroke* were selected. Hospitalisations resulting from diabetes can usually be avoided or reduced by adequate treatment (Burkert Nathali et al., 2014). For type 1 diabetes, this involves regularly injecting insulin, while for type 2 diabetes the focus is on lifestyle changes. Where these prove insufficient, blood sugar-lowering medications or insulin are administered (DiabetesSchweiz, 2019). Smoking and insufficient physical activity are common risk factors for congestive heart failure, myocardial infarction and stroke. While adequate outpatient treatment and patient compliance can prevent or reduce hospitalisations caused by congestive heart failure (Burkert Nathali et al., 2014), admission to hospital is unavoidable for acute myocardial infarction and stroke.

Respiratory diseases

Respiratory diseases are among the five leading causes of death and are a common reason for hospitalisation (Bundesamt für Statistik, 2019). The ACS diseases selected were *chronic obstructive pulmonary disease* (COPD) and *asthma*, neither of which are curable. (Burkert Nathali et al., 2014). The greatest risk factor for COPD is smoking. The course of the disease can be slowed down by stopping smoking, medication and physical activity (Lungenliga Schweiz, 2018). In asthma, the immune system overreacts to environmental stimuli such as cold and dry air, allergens such as mites or animal fur, smoking or air pollutants, but also to infections, stress and psychological influences. Asthma can be controlled by the administration of medication and avoiding triggers (Lungenliga Schweiz, 2020). The social gradient of the prevalence

of asthma is less pronounced than for COPD (Obsan, 2020a). Appropriate behaviour and treatment can avoid or reduce the need for hospitalisation in both COPD and asthma (Burkert Nathali et al., 2014), but socially disadvantaged groups often lack the resources required to do this.

Musculoskeletal diseases

The study looks at *osteoarthritis* and *back problems*. The three most important risk factors for musculoskeletal diseases cannot be changed: age, sex and genetic factors. Other risk factors for osteoarthritis are being overweight and physical overburdening of the joints. Osteoarthritis is one of the most common chronic diseases in Switzerland and the most frequent cause of hospitalisation due to joint diseases. Women with a low level of education have a significantly higher prevalence, but not men. (Obsan, 2020a). The primary treatment for osteoarthritis is self-management, training and weight loss if the patient is overweight (Hunter & Bierma-Zeinstra, 2019). Back and lower back pain is the most common health problem reported by the Swiss population (Federal Statistical Office, 2019). Prospective longitudinal studies have identified the following stresses as risk factors for the development of back pain: physical stress at work, such as severely monotonous work, lifting heavy objects and standing for long periods, psychosocial stresses, such as lack of social support at work, insecure employment, chronic stress, financial worries and sleep disorders (Taylor et al., 2014).

Mental disorders

The study analyses *affective*, *psychotic* and *alcohol-related mental disorders*. Unlike the majority of somatic chronic diseases, the first onset of mental disorders usually already occurs in adolescence and thus can both hinder the chances of obtaining a good education and make it more difficult to enter the workforce. This can result in those affected by mental disorders drawing a disability pension much earlier in their working lives than those with somatic diseases (Obsan, 2020b). A reverse causality can therefore also be seen in mental disorders: not only does low socioeconomic status increase the risk of morbidity, a severe chronic mental disorder can also result in a decline in social status. Depression, which is an affective disorder, is particularly prevalent in the Swiss population, accounting for around 10% of the total burden of disease measured in terms of the loss of years of healthy life (Bachmann et al., 2015). Affective disorders (and depression in particular) are the most common mental disorders encountered in inpatient care. In women, these are followed by psychotic disorders and, in men, disorders caused by the use of psychotropic substances (especially alcohol) and, again, psychotic disorders. The risk factors vary according to the type of mental disorder. Bipolar affective disorders and, in particular, psychotic disorders have a strong genetic component. Psychotic disorders often occur in tandem with alcohol and cannabis-related addictions. In the case of depression, social deprivation, negative life events and additional somatic diseases (e.g. chronic pain) are considered important risk factors (American Psychiatric Association, 2018; Fryers et al., 2005; Gouzoulis-Mayfrank, 2016).

Social situation and risks of hospitalisation due to specific chronic diseases (adjusted)

The multivariate logistic regression models (with adjustments for education, household type, age, gender, nationality and year of survey, see Section 2 Methodology), yield different relative hospitalisation risks depending on the disease and social indicator (see Section 2), which are explained below.

Differences by educational attainment

Of the various types of cancer, the statistically significant social gradient for lung cancer is striking, with clearly higher hospitalisation risks for individuals with a lower educational attainment (cf. G 3.3). Differences in smoking behaviour may explain a proportion of the increased risk in this regard. For breast cancer, there is a significant inverse gradient: Women with an upper secondary education (ISCED level 3) have a 10% lower risk of hospitalisation than women with tertiary education, while women who completed only compulsory education have a 20% lower risk of hospitalisation. This is consistent with inverse gradients in the incidence of breast cancer. There is no association with educational attainment for cancers of the colon and prostate.

Educational attainment is a significant predictor of the risk of hospitalisation in the three cardiovascular diseases and in the risk factor diabetes (which can be assumed to be primarily type 2). The observed gradient is significantly steeper for diabetes and congestive heart failure than for acute myocardial infarction and stroke. Individuals who completed only compulsory education have three times the risk of being hospitalised due to diabetes compared to those with tertiary education, and their risk of hospitalisation for congestive heart failure is twice as high. COPD and asthma also have strong, significant gradients, with odds ratios

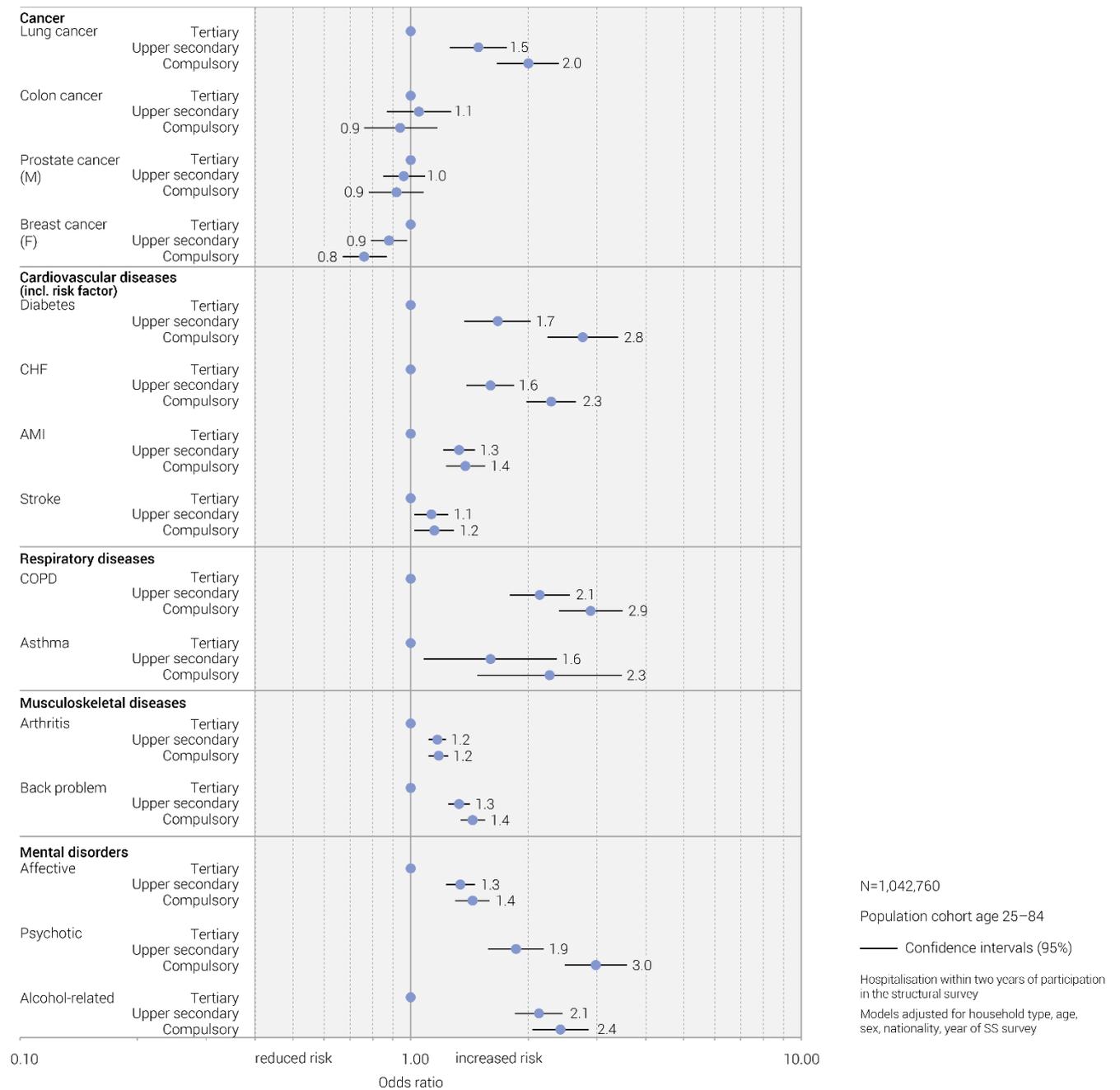
comparable to diabetes and heart failure. Hospitalisations of those with these four ACS diseases can often be prevented with adequate outpatient care, patient compliance, behavioural changes and self-management, which, as mentioned above, also depends on the resources of those affected and on the willingness and ability of the care system to respond to patients' individual needs. Acute myocardial infarctions and strokes, which, as a rule, require hospital treatment, show comparatively weak yet significant educational gradients.

There is a significantly increased risk of hospitalisation (in the order of 30%) due to osteoarthritis or back problems in people without tertiary education. In the case of back problems, the risk of the disease is demonstrably linked to various stressors (heavy lifting, extended periods spent standing, monotony of tasks), which are associated with the individual's occupation (Taylor et al., 2014). In addition, studies show that social inequality plays a role in the risks of back pain becoming chronic, which is explained by the complex interaction of biological and psychosocial factors (Fliesser et al., 2017; Gatchel et al., 2007).

In the case of the chronic somatic disorders that have been examined so far, it is plausible to conclude that differences in hospitalisation risks are the consequence, rather than the cause, of varying educational levels, as education is generally completed before the onset of the disease in middle to old age (see G 3.2). However, when looking at the mental disorders, which show similarly strong associations between educational attainment and hospitalisation risks as chronic somatic disorders, the reverse direction of causality is also conceivable. Mental disorders sometimes have their onset in adolescence and can pose challenges to obtaining vocational or academic qualifications. In such instances, the low level of education would be the consequence of the mental disorders and therefore not the cause of the increased risk of hospitalisation.

Hospitalisation risks by educational attainment and specific chronic diseases

G3.3



Source: SIHOS population cohort, age 25–84, SS 2010–2014 and MS 2011–2016

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Differences by household type

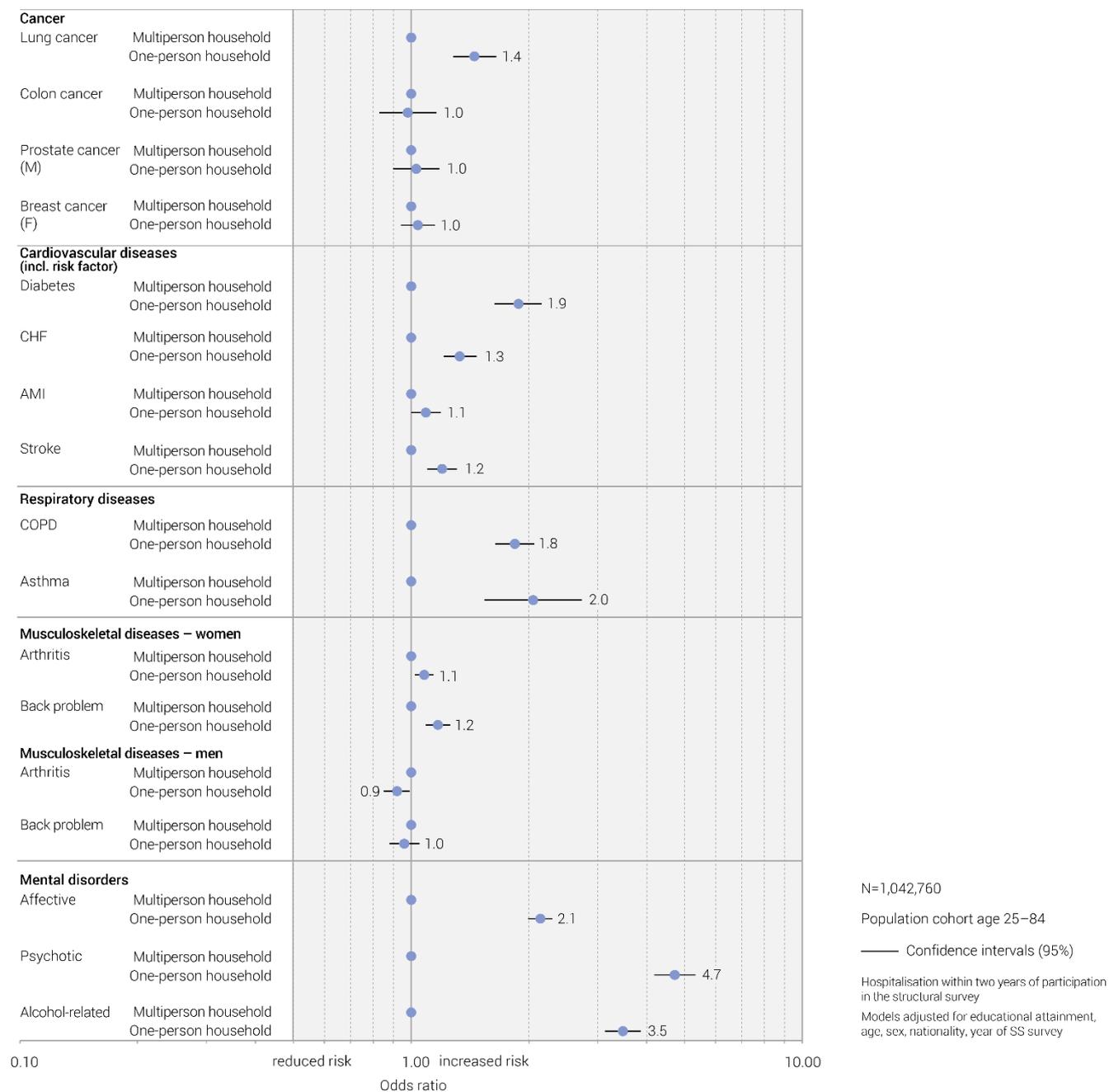
In the context of this study, “living alone” is used as an indicator of limited social resources (see Section 2 Methodology). It is a significant predictor for hospitalisation due to lung cancer (OR 1.4), but not for hospitalisation due to colon, prostate or breast cancer (see G 3.4). People who live alone have a significantly increased risk of hospitalisation due to cardiovascular and respiratory diseases. Individuals with diabetes, COPD and asthma have a risk almost twice as high as those who live with others, while the risk among individuals with congestive heart failure, myocardial infarction and stroke is 20% higher. Women in single-person households also have a significantly higher risk of being hospitalised for back problems and osteoarthritis, but men do not. A lack of social resources can lead to a higher risk of hospitalisation via various mechanisms. In addition to the increased risk of contracting a disease, those who live alone are likely to receive less immediate practical and emotional support in coping with the disease

than people who share a household with others. People living in the same household can also help ensure that the patient takes their medication and adheres to their treatment plan, which can help reduce the risk of hospitalisation.

The odds ratios for mental disorders are the highest and most statistically significant in the “living alone” indicator. Among people living alone the hospitalisation risk for psychotic disorders is increased by a factor of 4.7 and for alcohol-related disorders by a factor of 3.5. In the case of mental disorders, interactions with regard to social resources are also likely. As regards the association between social isolation and mental disorders, both directions of causality are plausible: for example, loneliness can trigger or intensify depressive episodes, but mental disorders conversely make relationships difficult and may lead to the discontinuation of social contacts.

Hospitalisation risks by household type and specific chronic diseases

G3.4



Source: SIHOS population cohort, age 25–84, SS 2010–2014 and MS 2011–2016

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Differences according to labour market integration

The analyses on labour market integration relate to people of working age (aged 25-64). Among this population group, the strongest gradients in somatic NCD in terms of economic inactivity are found for conditions that may result in severe functional limitations (cf. G 3.5). This is particularly the case for lung cancer, congestive heart failure, COPD and back problems. A progression of the disease is often likely to compel those affected to give up work or results in them losing their jobs. Should the chronic disease be accompanied by a lack of social support or even conflict in the workplace, it may give rise to a mutually reinforcing negative dynamic that can result in withdrawal from the labour market (Taylor et al., 2014).

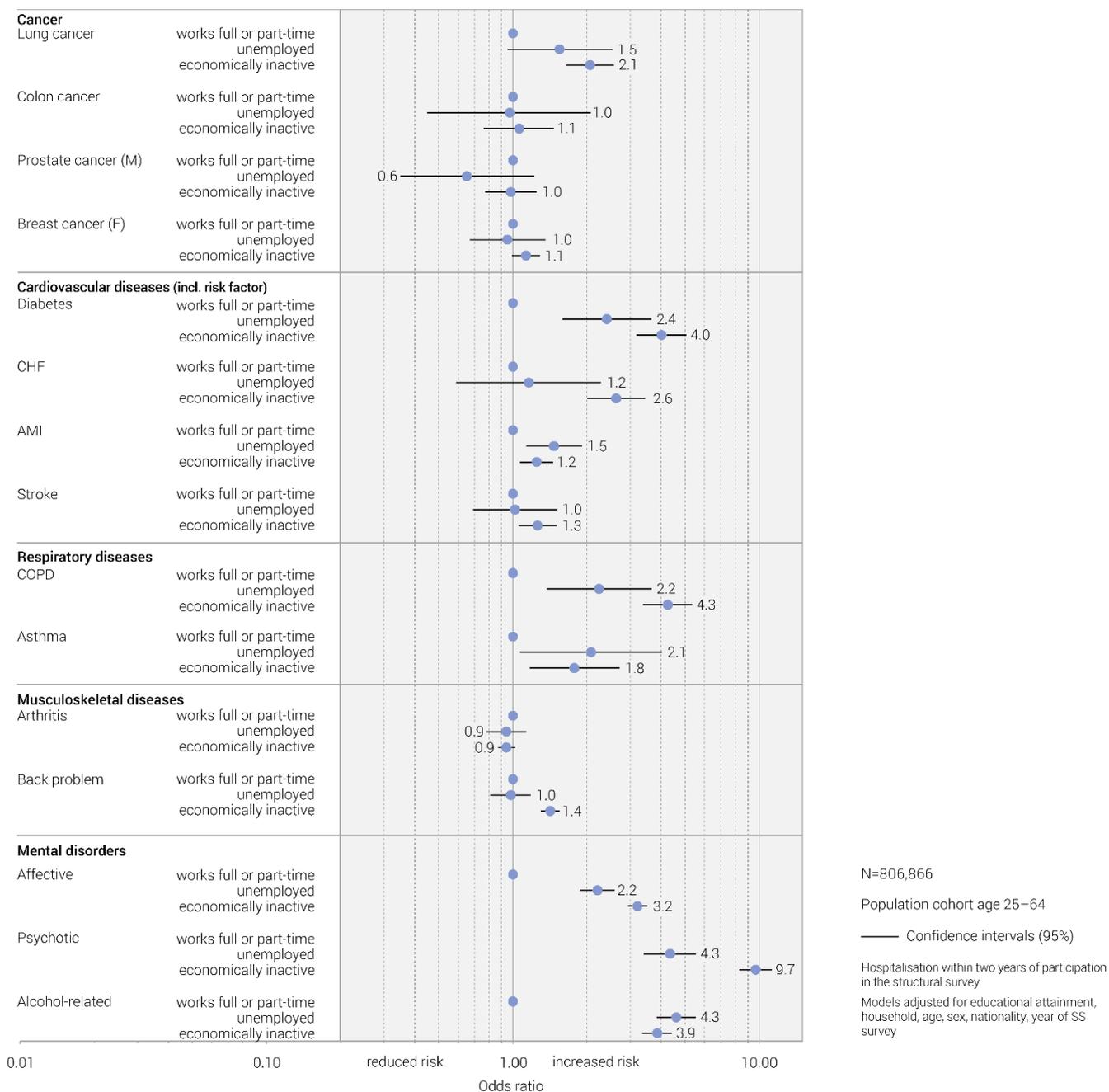
In the case of diabetes, on the other hand, obesity could be a major factor in the increased hospitalisation risks of those looking for work and the economically inactive. Being overweight is a known risk factor for type 2 diabetes and, among women in particular, also increases the risk of loss of employment, unemployment and low wages. The reasons for this are assumed to be a reduction in productivity due to the disease as well as prejudice and discrimination on the part of employers (Harkonen et al., 2011).

Compared to those in employment, those looking for work have a 50% higher risk of being hospitalised for myocardial infarction, while the risk is 20% higher in the economically inactive. It is known that recent loss of employment increases the risk of death (Bachmann & Neuhaus, 2010) and there is also an increase in the risk of cardiovascular disease among older workers (Gallo et al., 2006). It is therefore plausible that loss of employment is associated with an increased risk of hospitalisation for myocardial infarction. Those looking for work also have an increased risk of hospitalisation due to asthma; the stress resulting from loss of employment could also lead to a deterioration and subsequent hospitalisation for the condition.

Those looking for work and the economically inactive have an often substantially raised risk of hospitalisation due to mental disorders. For example, the risk of hospitalisation due to psychosis is increased by a factor of 10 for individuals who are economically inactive and by a factor of 4 for those looking for work. Consistent with the results of other studies, these impressive figures reflect the difficulties of people with mental disorders in gaining a foothold in the labour market - particularly with an early onset in adolescence - and the high risk of losing their jobs (Baer et al., 2013).

Hospitalisation risks by labour market integration and specific chronic diseases

G3.5



N=806,866
 Population cohort age 25-64
 — Confidence intervals (95%)
 Hospitalisation within two years of participation in the structural survey
 Models adjusted for educational attainment, household, age, sex, nationality, year of SS survey

Source: SIHOS population cohort, age 25-64, SS 2010-2014 and MS 2011-2016

4 Discussion and conclusions

For the first time, it can be demonstrated that in Switzerland certain social groups have an increased risk of hospitalisation due to chronic conditions. Those affected are people with low education attainment, limited social resources and those not integrated into the labour market. The results also show that the impact of a person's social situation on the risk of hospitalisation depends on the type of chronic condition. In many diseases the social gradient is clearly recognisable, while some show no association and a few (such as breast cancer) display an inverse social gradient. In the case of many chronic diseases, hospitalisation is the outcome of a chain of processes that are influenced by a variety of factors and that take place over many years. With regard to social inequality, socially unequal exposure to risk factors (including occupational stress, unhealthy behaviours and chronic stress) and social differences in the availability of resources that influence the development of the disease are particularly relevant. Other factors come into play in those already ill, such as whether or not they seek help, the nature and accessibility of care in the outpatient healthcare system and the capabilities and opportunities of managing the disease. The socially unequal distribution of hospitalisation risks that this study found can be attributed to an accumulation of these factors.

The data from the SIHOS study do not permit us to pinpoint directly the proportionate role played by the various factors in the final outcome (need for hospitalisation). Nonetheless, a differentiated consideration of specific diseases on the one hand and a variety of factors relating to the social situation on the other makes it possible to draw the following conclusions:

- Particularly large social inequalities in hospitalisation risks are evident in the case of those chronic diseases that are referred to as *ambulatory care sensitive*, whose course can be positively influenced by patient-centred care and successful joint management by the patient and health professionals. Among other things, this requires not only a relationship of trust between professionals and patient, but also a corresponding room for manoeuvre on the part of those affected (e.g. the adaptation of conditions in the workplace).
- Successfully coping with disease, therapy adherence, adaptations in the workplace or changes in lifestyle are far harder to achieve for people in a precarious situation. Establishing a common understanding of the disease and integrating treatment in the patient's everyday life requires time and competence on the part of the healthcare professionals. The tariff system should therefore ensure that time spent talking with patients is sufficiently compensated.
- These results also indicate that a closer intertwining between healthcare and social services would be helpful in order to avoid subjective suffering and hospitalisation among the socially disadvantaged chronically ill.
- The risks for many chronic diseases and their time of onset are unequally distributed in social terms in Switzerland. A stronger orientation of behavioural and situational prevention towards socially disadvantaged population groups is necessary if the development of these diseases is to be prevented or their onset postponed.
- Finally, our results point to a close association between health and labour market integration, e.g. with regard to the difficulties faced by those with mental disorders and the increased risk of myocardial infarction among those looking for work. In this area too, new approaches that provide better care and support for those affected are needed not only in the healthcare system. Professional (re)integration programmes should be improved, more companies should employ and support employees with health problems and, finally, social insurance authorities, social welfare and society need to adopt a resource-enhancing approach to those looking for work.

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