Nursing home residents' ADL status, institution-dwelling and association with outdoor activity: a cross-sectional study

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ABSTRACT

Introduction. The Norwegian regulations for nursing homes consider access to meaningful activities to be an indicator for the quality of nursing homes. Activities of daily living (ADL) provide important basic self-care skills for nursing home residents. Due to the physical changes caused by ageing and comorbidities, nursing home residents may experience functional decline over time, which may affect their ability to perform meaningful ADL, such as outdoor activity, which is considered a valuable and meaningful activity in Norwegian culture. This study aimed to investigate the association between ADL status, institution-dwelling and outdoor activity among nursing home residents.

Methods. This cross-sectional study included 784 residents aged >67 years living in 21 nursing homes in 15 Norwegian municipalities between November 2016 and May 2018. The Barthel Index was used to assess the nursing home residents' ADL status. Other variables collected were age, gender, body weight and height, visits per month, institution, ward, and participation in weekly outdoor activities. Descriptive statistics were used to provide an overview of the residents' characteristics. A Poisson regression model was used to test the association between the outdoor activity level as the dependent variable and ADL score, institution, and other control variables as independent variables.

Results. More than half (57%) of the nursing home residents in this sample did not go outdoors. More than 50% of the residents had an ADL score <10, which indicates low performance status. Further, we found that residents' ADL status, institution, ward, and number of visits had an impact on how often the residents went outdoors.

Discussion. The nursing home residents in this study rarely went outdoors, which is interesting because Norwegians appreciate this activity. Differences in the number of visits might explain why some residents went outdoors more often than other residents did. Our findings also highlight that the institutions impact the outdoor activity. How the institutions are organized and

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44 how important this activity is considered to be in the institutions determine how often the activity

45 is performed.

46 **Conclusion.** The low frequency of the outdoor activities might be explained by a low ADL

47 score. More than 50% of the residents had an ADL score <10, which indicates low performance

48 status. Despite regulations for nursing home quality in Norway, this result suggests that

49 organizational differences matter, which is an important implication for further research, health

50 policy and practice.

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Introduction

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58 Norway is an example of the Nordic welfare model and its welfare state is characterized by

59 public funding and service provision (Esping-Andersen et al. 2002). Norwegian nursing homes

60 are publicly financed, and the municipalities are responsible for providing this service. Access to

61 meaningful activities is a reference for the quality of nursing homes as highlighted in Norwegian

62 regulations for nursing homes (Forskr kvalitet i pleie- og omsorgstjenestene 2003). This

63 regulation, with its specific recommendations, can be used as an indicator to assess the quality of

64 care in nursing homes (Kirkevold & Engedal 2006). The regulations require the municipalities to

65 ensure that each resident is offered varied and customised activities in line with other

66 fundamentals of care (Forskr kvalitet i pleie- og omsorgstjenestene 2003).

67 The availability of activities for nursing home residents may contribute to their well-being and

68 dignity (Björk et al. 2017; Lampinen et al. 2006b; Slettebø et al. 2016). By contrast, according to

69 Nåden et al. (2013), the lack of participation in activities in nursing homes may be explained by

70 the residents' physical impairments, e.g., some residents need to use wheelchairs. Up to 80% of

71 nursing home residents experience cognitive impairment (Selbaek et al. 2007), which may also

72 limit their ability to participate in activities such as playing cards, bingo and reading groups

73 (Strøm et al. 2016).

74 The outdoor lifestyle traditionally holds a prominent position in Norwegian culture (Gurholt

75 & Broch 2019) and is considered as a valuable and meaningful activity. Unfortunately, recent

76 inspections undertaken by the authorities in nursing homes in Norway show a lack of activity

77 offerings (Helsetilsynet 2018a; Helsetilsynet 2018b; Helsetilsynet 2018c). The limited activity

78 options indicate that the government's current policy and new regulations to increase the level of

79 activities in Norwegian nursing homes have not yet succeeded (Helsetilsynet 2018a; Kjøs &

80 Havig 2016; Sandvoll et al. 2020; Sandvoll et al. 2012).

81 Despite the new regulations, changing nursing home practices is difficult (Sandvoll et al.

82 2012). According to Palacios-Cena et al. (2015), nursing homes should strive to develop

83 meaningful activities for residents to occupy their time and to provide residents with a

84 meaningful sense of purpose. However, low levels of activities of daily living (ADL) among the

85 residents can affect their ability to participate in activities (Bürge et al. 2012). ADL are an

86 important basic self-care skill for the general population as well as for nursing home residents.

87 Because of physical changes associated with ageing and comorbidities, nursing home residents

88   may experience functional decline over time (Drageset et al. 2011; Liu et al. 2015). Reduced
89   ADL status may impair the ability to perform activities and can impact quality of life, social
90   contact and loneliness (Liu et al. 2014b).

91   Physical activity, rehabilitation or exercise may improve independence and prevent the
92   decline in ADL in elderly residents in long-term care facilities (Bürge et al. 2012; Crocker et al.
93   2013; Liu et al. 2014b). It is unclear which interventions are most appropriate for slowing the
94   decline in ADL (Crocker et al. 2013), but it has been suggested that health professionals should
95   promote physical activities with the aim of improving ADL performance among older adults
96   (Bürge et al. 2012). The loss of ADL independence is the strongest predictor of the need for
97   institutionalization of the elderly (Gaugler et al. 2007).

98   Several factors might influence nursing home residents' ADL status. Previous research has
99   investigated the importance of ADL related to different aspects, such as loneliness, less
100 participation in activities and depression. (Drageset 2004) has shown that dependence in ADL
101 status is associated with a high level of social loneliness. (Drageset et al. 2011) later showed that
102 greater dependence in ADL was associated with more symptoms of depression. Poor balance,
103 incontinence, impaired cognition, low body mass index (BMI), impaired vision, no daily contact
104 with proxies, impaired hearing and the presence of depression were significant risk factors for
105 nursing home residents who experienced a decline in ADL status (Bürge et al. 2012).

106   Few studies have focused on the relationships between ADL status and participation in
107 different activities among nursing home residents. One study investigated physical and social
108 aspects of residents' mobility level and reported that nursing home residents dependent on a
109 wheelchair or elevator during care were less involved in physical and social activities compared
110 with more-mobile residents (Kjøs & Havig 2016). This study suggests that reduced mobility
111 might influence participation in different activities offered in the nursing homes. The need for
112 activities and engagement in nursing home residents is well known (Björk et al. 2017; Kjøs &
113 Havig 2016; Lampinen et al. 2006a; Palacios-Ceña et al. 2015; Theurer et al. 2015). More
114 research is needed on residents' ADL status and its relationship with participation in different
115 activities, such as going outdoors.

116   Despite Norwegian regulations (Forskr kvalitet i pleie- og omsorgstjenestene 2003), the
117 frequency and content of activities are very much up to each nursing home. Previous studies
118 have shown differences between privately owned and government-owned facilities (Liu et al.

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120 2014a). Furthermore, previous studies have shown variations in practice regarding activities in

121 Norwegian nursing homes (Isaksen et al. 2018). To the best of our knowledge, however, little is

122 known on differences between institutions regarding their outdoor activities.

123   The aim of this study was to investigate the association between nursing home residents ADL

124 status, institution-dwelling and outdoor activity. The following research question was

125 formulated: *To what extent are nursing home residents' ADL status and the institution they live*

126 *in associated with outdoor activity?*

Methods

128 A cross-sectional design was used.

Setting

130 The data were collected by first-year nursing students during their placement in nursing homes

131 between November 2016 and May 2018. The placement was either during the autumn semester,

132 i.e., 8 weeks from the middle of October until the middle of December, or 8 weeks during the

133 spring semester, from the middle of April until the middle of June. The data were collected

134 during the daytime by means of a study manual, which the students had been presented in

135 lectures at the university. For standardized instruments and questionnaires, we used the

136 connected manual, procedure or protocol. The process of data collection was supervised by the

137 university teacher and the nurses working at the different nursing homes. Each patient was

138 registered once.

139   Our responses were collected from 21 different nursing homes. These institutions differ

140 because they have different combinations of ward types and may have different attitudes towards

141 outdoor activity. All nursing homes in this study except for one are financed and operated by the

142 municipality. The single private nursing home is not run by a commercial actor, but by the parish

143 associated with the Bergen Cathedral in Bergen, the second largest city and municipality in

144 Norway. Nursing homes all share the same national financing system.

145

Participants

147 The study included 784 residents aged >67 years living in 21 nursing homes in 15 Norwegian

148 municipalities. The inclusion criteria were all residents aged >67 years living in the selected

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187 nursing homes, while the exclusion criteria were residents receiving palliative care, related to

188 ethical considerations, to protect them from harm related to the completion of questionnaires in

189 their presence. In addition, residents in the palliative phase may be unable to take part in the

190 outdoor activities described in this paper. Five of the nursing homes were located in rural areas,

191 while others were located in small villages. The nursing homes were not selected completely at

192 random because the selection was partially determined by what nursing homes the nursing

193 students attended during their practice period.

194

Variables

196 We expected increasing levels of outdoor activities, e.g., making trips outside the nursing home,

197 with increasing *ADL score* because ADL is a measurement of physical capability (higher scores

198 mean better capabilities). We observed the residents by using the method described in the Barthel

199 Index for measuring performance in ADL, as translated and revised by Saltvedt et al. (2008).

200 Each performance item is rated on this scale with a given number of points assigned to each

201 level, related to how dependent or independent the resident is, with maximum of 20 points (20 =

202 totally dependent). The Barthel Index is a standardized, validated and psychometric-tested

203 instrument widely used in the context of elderly care (Liu et al. 2015; Mahoney & Barthel 1965).

204

205 *Outdoor activity* is the dependent variable in our analysis. In this study, the residents either

206 walked on their own or with assistance from staff or visitors. Some residents went outdoors with

207 a walker or in a wheelchair. Some of the residents had an electric wheelchair and went outside on

208 their own. However, the purpose was still the same: outdoor activity. The level of this activity

209 was measured and documented as the number of times the activity was performed during a week.

210

211 Further, we introduce *nursing homes* as random effects to allow for the fact that not all types of

212 nursing homes are included. Our nursing homes or institutions represent a sample from a larger

213 unknown population. The characteristics of that population is a latent, unmeasured factor

214 accounted for by introducing institutions as random effects. These effects will tell us whether

215 activity levels vary between institutions. We included a dummy variable for residing in a short-

216 term/rehabilitation ward and one for residing in a dementia ward. Long-term ward residents are

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Deleted: ten variables with possible scores in the Barthel scale are: help needed with eating (0–2), help needed with bathing (0–1), help needed with personal hygiene (0–1), help needed with dressing (0–2), presence or absence of faecal incontinence (0–2), presence or absence of urinary incontinence (0–2), help needed with toilet use (0–2), help needed with walking/mobility (0–3), help needed with transfers (0–3), and help needed with climbing stairs (0–2).

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238 expected to be older, frailer and in need of more care; thus, we expected these residents to have
239 the lowest levels of making trips outside the nursing home.
240
241 The *number of visits* (per week) is interpreted as a proxy for social isolation (Drageset 2004). We
242 expected that more visits would lead to higher levels of outdoor activities. More visits may also
243 mean that relatives engage in this activity, which increases the level of ADL.
244 Further, we expected decreasing levels of activity with increasing *age* (Feng et al. 2017).
245 The gender dummy variable was coded as 1 for men and 0 for women. We had no specific
246 expectations for a gender effect on making trips outside the nursing home.
247 *BMI* is an indication of the general health condition. A low BMI indicates that residents are not
248 eating enough (or that they fail to maintain their body weight). We expected that low BMI would
249 be associated with fewer trips outside the nursing home.
250 All variables were registered in a form and documented in Excel version 16.16.19 (Microsoft,
251 Redmond, WA, USA).
252

Bias

254 There are some limitations in using this approach. Firstly, we did not secure complete
255 randomization in selecting the residents for observation. The students may understand the
256 concept differently or they did not apply it consistently. Secondly, a detailed protocol was
257 provided to the students so that their observations were made consistently. For instance, what
258 date format should be used, and age and length of stay should be integer numbers. We could not
259 eliminate ambivalence in the data collection completely.

Statistical methods

261 We designed a model with outdoor activity as the dependent variable and ADL status as an
262 explanatory variable affecting the level of this activity. In addition, we controlled for several
263 other explanatory variables that may have an influence on both activity level and ADL scores,
264 thereby eliminating possible spurious factors. We also included institutions as an independent
265 variable, assuming they are random effects, which allows the coefficients to vary between
266 institutions.

8

Descriptive statistics were used to give an overview of the demographic and clinical characteristics of the participants, including age, gender, BMI, ADL status, institution and the prevalence of residents' outdoor activities. We sorted the informants into different groups according to the quartiles from the distribution of ADL scores. We then analysed the levels of the outdoor activities between these groups. To further examine the association between ADL score and outdoor activity, we included age, BMI, gender, visits per month, type of ward and ADL score as well as institutions in a multivariate Poisson regression model. The data were analysed using the SAS GLIMMIX procedure with a Poisson log-link function. The two-sided significance level was set to 0.05.

We assume that institutions (nursing homes) represent several unmeasured characteristics that vary between them. These characteristics may be different service quality, different organizations, different informal routines established among staff, different efficiency in using resources, or different resident characteristics. These characteristics are not measured and probably cannot be measured. Therefore, we introduced nursing homes as random effects in the regression model to account for these variations. Consequently, the estimated coefficients are allowed to vary between nursing homes. The impacts of different ward types are fixed effects since ward types have the same definition for all nursing homes and therefore do not measure any latent characteristics. Thus, each nursing home has an individual-specific random effect in addition to this fixed effect of ward type (SAS Institute 2019). A mixed model with both fixed and random effects designed to capture variations between clusters is called a conditional model (Muff et al. 2016). The clusters in the estimated model consist of nursing homes.

The model allowed us to control for other regressors when assessing the effect of ADL score or institutions on outdoor activity. Thus, we could compare activity level between residents in the same ward and with the same age, gender, number of visits per month and BMI, but with different ADL scores in different institutions.

Clustering occurs when entities are distributed on several levels. When this is the case, error terms within a cluster will not be independently distributed of error terms in another cluster (Trutschel et al. 2017). In our design, this means that error terms between nursing homes will be biased if they are not acounted for in the regression model. We have already considered different ward types because the chance of a resident performing the activity may be affected by the ward type in which the resident lives. Nursing homes (institutions) and ward types are two cluster

types; therefore, we should also consider differences between nursing homes in the regression model.

Table 1 Model statistics for Poisson regression model for outdoor activities in the preceding week as a dependent variable

Goodness-of-fit criteria	df	χ^2	χ^2/df
Generalized chi-square	774	1216.3	1.57
Number of observations		784	

Table 1 shows the goodness-of-fit values for the regression model with trips outside the nursing home in the preceding week as the dependent variable. The dispersion criteria χ^2/df has a value <2. Therefore, we assumed no overdispersion in the model and we continued with a Poisson model rather than substituting it with a model correcting for overdispersion such as a negative-binomial model.

All statistical analyses were performed using SAS software (University Edition; SAS Institute, Cary, NC, USA).

Ethics

The Regional Medical Ethics Committee REK West, University of Bergen (2015/2030 REK WEST, University of Bergen) and the Norwegian Social Science Data Services (46303) approved the study, which was endorsed by all nursing homes. Voluntary, written informed consent was obtained from all participants. In situations where the resident was not able to give consent related to e.g., dementia or cognitive impairment, either the resident's relatives or the department manager gave consent.

Results

The sample (*n* = 784), presented in table 2, included more women (69%) than men (31%), , which is consistent with the population distribution in this age group (Statistisk Sentralbyrå 2016). Most residents in our sample (55%) resided in a long-term facility, 26% resided in a dementia ward and 19% resided in a short-term ward (table 2). The mean ADL score was 10.1. We distributed residents into groups according to their ADL score using the quartiles from the ADL distribution, which resulted in about the same number of residents in each group. Twenty-eight per cent of the residents had an ADL score of 0–6 points as measured by the Barthel Index,

593 24% had an ADL score of 7–10 points, 26% had an ADL score of 11–14 points and 23% had an
594 ADL score >15 points.

595 **Table 2 Sample, gender, mean age and ward.**

Variable	Value	Frequency	Relative frequency (%)	Mean age (years)
Gender	Female	541	69.0	87.1
	Male	243	31.0	84.7
	Total	784	100.0	86.3
Ward	Dementia	200	26	84.8
	Short term	152	19	83.7
	Long term	432	55	87.9
	Total	784	100	86.3

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598 **Table 3 Association between ADL score and mean participation in outdoor activities**

	ADL groups				Total
	0–6	7–10	11–14	Over 15	
Number of outdoor activities in the preceding week	0.6	0.7	0.8	1.4	0.8

599

600 Table 3 shows the participation levels for the outdoor activity in the different ADL groups
601 divided into quartiles from the ADL distribution. Participation is relatively stable; however, it
602 decreased in the lowest two ADL groups.

603 Table 4 shows descriptive statistics for the dependent variable, trip outdoors last week. Table
604 5 shows descriptive statistics for numeric variables used as independent variables while Table 6
605 shows descriptive statistics for categorical variables used as independent variables.

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608 **Table 4 Descriptive statistics for dependent variable, trips outdoors last week**

Trip outdoors last week

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Commented [EKG22R20]: Hvis tidsskriftet tar så mange tabeller? Her ber fagfellene om tabell. Vi kan be redaktøren om om å få bruke disse tre (hvis det er begrensning).
Deleted: Figure 1 Histogram of the distribution of outdoor activities in the preceding week
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Figure 1 shows the distribution of outdoor activities in the preceding week, i.e., trips outside the nursing home. The residents rarely went outdoors: e.g., 57.3% of residents never went outside during the week, while one resident made 14 trips. A few residents went outdoors more often than did the majority, which skewed the distribution to the right.¶
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Min	0
Median	0
Max	14
Number of observations	788

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630   Table 5 **Descriptive statistics for numeric independent variables**

	Mean	Standard deviation	Number of observations
ADL score	10.1	5.2	787
Age	86.3	7.2	786
Visits per month	8.9	8.8	787
Body mass index	24.2	5	785

631

632   Table 6 **Descriptive statistics for categorical variables used as independent variables**

	N	% of total
Ward type		
Short-term/rehab	153	19.4
Long-term	434	55.1
Dementia	200	25.4
Total	787	99.9
Gender		
Female	543	69
Male	244	31
Total	787	100
Nursing home		
InstId 1	74	9.4
InstId 2	43	5.5
InstId 3	60	7.6
InstId 4	37	4.7
InstId 5	10	1.3
InstId 6	39	5
InstId 7	52	6.6
InstId 8	43	5.5
InstId 9	22	2.8
InstId 10	123	15.6
InstId 11	5	0.6
InstId 12	45	5.7
InstId 13	25	3.2
InstId 15	96	12.2
InstId 16	26	3.3

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InstId 17	15	1.9
InstId 19	27	3.4
InstId 20	18	2.3
InstId 21	5	0.6
InstId 22	7	0.9
InstId 23	15	1.9
Total	787	100

Tables 7 and 8 show the results of the model estimation with outdoor activities in the preceding week as the dependent variable. Long-term ward type is the reference case for ward types and its effect is measured by the model's general intercept. The ADL score has a significant impact on the activity. An increase in the ADL score of 1 was expected to give an increase in the rate of activity level of 1.05. We show this effect by considering two residents, both women aged 85 years, living in a long-term ward, receiving 6 visits per month and having a BMI of 23.8 kg/m^2 (the last two numbers are median values). Both women live in institution number 1. Resident A had an ADL score of 10, while resident B had an ADL score of 15. From our model, we expected resident A to take 0.43 trips outside the nursing home in the preceding week and resident B to take 0.56 trips. Accordingly, we expected that 16 days would be needed for resident A to take one trip outdoors and 13 days would be needed for resident B. Had the two residents lived in institution number 7, the expected number of trips would have been 1.3 and 1.7 trips outdoors, assuming values for age, number of visits, BMI and gender stay the same and ADL score is 10 and 15, respectively, as above. In other words, both residents A and B would have three times more outdoor activities if they had been living in institution 7 instead of 1. This result shows that institutions have an impact on activity level. This is confirmed by estimation of institutional random effects in Table 8 where eight institutions have significant effects, four of them are positive.

Table 7 Model estimates of outdoor activities in the preceding week: Poisson regression

Effect	Estimate	Standard error	df	t value	Pr > |t|
Intercept	0.941	0.590	20	1.59	0.127

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ADL	0.052	0.008	756	6.72	<.0001
Gender (1 = Male)	0.102	0.086	756	1.19	0.236
Age	−0.024	0.006	756	−4.18	<.0001
Visit Pr month	0.030	0.004	756	7.74	<.0001
BMI	−0.005	0.008	756	−0.61	0.545
Dementia	0.463	0.116	756	4.01	<.0001
Short-term rehabilitation ward	−0.309	0.135	756	−2.29	0.022

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688

689 **Table 8 Model estimates of outdoor activities in the preceding week: random effects**

Institution	Estimate	Std Err Pred	df	t value	Pr > |t|
InstId 1	−0.451	0.191	756	−2.36	0.019
InstId 2	0.583	0.177	756	3.28	0.001
InstId 3	−0.2667	0.170	756	−1.57	0.116
InstId 4	−0.047	0.219	756	−0.21	0.831
InstId 5	−0.155	0.313	756	−0.5	0.620
InstId 6	−0.475	0.226	756	−2.11	0.036
InstId 7	0.674	0.152	756	4.42	<.0001
InstId 8	−0.593	0.266	756	−2.23	0.026
InstId 9	0.084	0.216	756	0.39	0.698
InstId 10	−0.055	0.151	756	−0.36	0.718
InstId 11	0.641	0.312	756	2.06	0.040
InstId 12	0.406	0.174	756	2.33	0.020
InstId 13	0.141	0.224	756	0.63	0.529
InstId15	−0.040	0.154	756	−0.26	0.796
InstId 16	−0.305	0.241	756	−1.27	0.206
InstId 17	0.468	0.255	756	1.84	0.066
InstId 19	−0.542	0.248	756	−2.18	0.029
InstId 20	0.135	0.245	756	0.55	0.581
InstId 21	−0.396	0.341	756	−1.16	0.247

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InstId 22	0.011	0.311	756	0.04	0.971
InstId 23	0.181	0.244	756	0.74	0.460

731   Table 7 also shows that age, visits per month and ward type had significant effects on the

732 number of outdoor activities during the week. All effects were as expected: i.e., increasing age

733 was associated with a lower activity level, whereas an increasing number of visits were

734 associated with more trips outside the nursing home. The effects of short-term wards were

735 negative, indicating that residents in that ward type took significantly fewer trips outside the

736 nursing home than did residents in the long-term ward. Residents in dementia wards took

737 significantly more trips outdoors than residents in long-term wards. BMI had no significant

738 effect on the number of outdoor activities.

739   We also estimated a zero-inflated Poissson model to account for the large number of

740 observations with zero trips outdoors. The model was designed as a mixed model with nursing

741 homes as random effects. The model estimates zero outcomes separately using ADL scores as

742 predictor variable. This was done in SAS according to the algorithm described by Instiue for

743 Digital Research & Education (UCLA 2020). There was little difference compared to the model

744 estimated in Table 7 and Table 8. The same independent variables had significant impacts and

745 there was no substantial change in coefficient values.

Discussion

747 Our findings show that 57% of the nursing home residents in this sample did not go outdoors.

748 This is consistent with other studies showing that the activities offered in nursing homes are

749 limited (Kjøs & Havig 2016) and that the residents often are inactive (Harper Ice 2002). Recent

750 inspections of nursing homes undertaken by the Norwegian authorities confirm the lack of

751 activity offerings (Helsetilsynet 2018a; Helsetilsynet 2018b; Helsetilsynet 2018c).

752   The findings of our study might be explained by the residents' ADL score, which was low:

753 i.e., 50% of the residents had an ADL score between 0 and 10. These low ADL scores indicate

754 that these residents had a low ability to go outdoors. This is consistent with national health

755 policies in Norway, which emphasize that the frailest elderly should receive care in nursing

756 homes. It is also in line with previous research that shows that the frailest residents might not be

757 able to go outdoors because of their old age, fatigue, frailty or illness (Nåden et al. 2013).

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Tables 4 and 5 show the results of the model estimation with outdoor activities in the preceding week as the dependent variable. Long-term ward type is the reference case for ward types and its effect is measured by the model's general intercept. The ADL score has a significant effect impact on the activity. An increase in the ADL score of 1 was expected to give an increase in the rate of activity level of 1.05. We show this effect by considering two residents, both women aged 85 years, living in a long-term ward, receiving 6 visits per month and having a BMI of 23.8 kg/m^2 (the last two numbers are median values). Both women live in institution number 1. Resident A had an ADL score of 10, while resident B had an ADL score of 15. From our model, we expected resident A to take 0.43 trips outside the nursing home in the preceding week and resident B to take 0.56 trips. Accordingly, we expected that 16 days would be needed for resident A to take one trip outdoors and 13 days would be needed for resident B. Had the two residents lived in institution number 7, the expected number of trips would have been 1.3 and 1.7 trips outdoors, assuming values for age, number of visits, BMI and gender are stay the same and ADL score is 10 and 15, respectively, as above. In other words, both residents A and B would have three times more outdoor activities if they had been living in institution 7 instead of 1. This result shows that institutions have an effectimpact on activity level. This is confirmed by estimation of institutional random effects in Table 8 where All in all, eight institutions have significant effects, while four of them are positive.¶

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801   However, Björk et al. (2017) performed a similar study in Sweden and reported that 60% of
802   the nursing home residents had gone outdoors during the data collection period (November
803   2013–September 2014). The differences in going outside the nursing home in these similar
804   studies from the Scandinavian health-care context are interesting. Weather and the need for
805   appropriate clothing or equipment can impede the ability of residents to go outdoors. If Björk et
806   al. (2017) collected data during the summer, it might explain some of these differences. Our data
807   were collected either during autumn or spring. In Norway the temperature and weather
808   conditions often are warmer and contain less rain during July and August, and the residents are
809   more likely to go outdoors. This might explain why the residents in the Swedish study went
810   outside more often (Björk et al. 2017). Further, our data were collected in the western part of
811   Norway, which has more rain compared to the eastern parts of Norway where most people live.
812   In addition, these residents might not have proper clothing like raincoats, warm jackets,
813   appropriate shoes or hats suitable for the different weather conditions. The British Broadcasting
814   Corporation (BBC 2018) has shown how the use of a rickshaw with a roof and cover may be an
815   alternative for helping frail elderly people to perform outdoor activities despite their loss in ADL
816   status. The concept of outdoor life, in particular hiking, has a prominent position in the
817   Norwegian culture (Gurholt & Broch 2019). In addition, most of the older population in Norway
818   grew up after the last world war; therefore, many have received basic socialization in outdoor life
819   and have maintained their association with outdoor activities throughout their lives (Odden
820   2008).
821   Our findings highlight that institutions have an impact on how often residents go outdoors.
822   These findings suggest that organizational differences impact outdoor activity. How the
823   institutions are organized and the importance they give this activity obviously determine how
824   often it is performed. These findings are in line with Isaksen et al. (2018), who found that only
825   four of 17 nursing homes had activity plans for the wards. Further, they found variations in staff
826   who had participated in training program regarding activities for the residents (Isaksen et al.
827   2018). Even if the service going outdoor is regulated by national regulations (Forskr kvalitet i
828   pleie- og omsorgstjenestene 2003), there is considerable room for adaption in each nursing
829   home. The variation in service provision between nursing homes comes from different cultures,
830   organizational practices and plainly the priority the service gets when set against other services
831   the nursing homes are obliged to provide (Nakrem 2015). To increase the level of activity,

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849 students should be given more information about the benefits of the activity for nursing home
850 residents as well as the legal rights of this activity.

851   Physical activity is important for mental well-being among elderly people (Lampinen et al.
852 2006b). However, our findings show that increasing age was associated with lower activity
853 levels, which is also in line with Feng et al. (2017). This might imply a natural change from
854 being active to being less active and in need for assistance, which corresponds with the process
855 of disengagement described by Cumming and Henry in 1961 (Daatland & Solem 2011). When
856 people get older, it is natural for them to gradually withdraw from their social roles and the
857 activities they used to perform. This is in line with Adams et al. (2011), who found that activity
858 participation in late life changed from an active social life with creative activities to an increased
859 participation in passive social and spiritual activities. Nursing homes must consider this and meet
860 their residents' individual needs and interests. According to the Norwegian quality regulations,
861 nursing home residents should be offered varied and customized activities (Forskr kvalitet i
862 pleie- og omsorgstjenestene 2003). Nursing homes need to facilitate activities that are suitable
863 for each resident's ADL status and individual wishes. For example, it might be important for
864 residents to have their own personal things near their own chair. A nearby table might contain
865 personal important objects, such as magazines, books, newspapers or medicines (Board &
866 McCormack 2018). Nursing home residents who are no longer capable or do not want to go
867 outside might appreciate a nice view (Eijkelenboom et al. 2017). Activities are a basic need and
868 participation in activities might contribute to the well-being and dignity experienced by nursing
869 home residents (Björk et al. 2017; Lampinen et al. 2006b; Slettebø et al. 2016). Such activities
870 should be organized by the staff in close co-operation with relatives because they are familiar
871 with the residents' needs (Sandvoll et al. 2012).

872   Previous research shows that nursing home staff are committed to routines, such as helping
873 residents with personal care, practical help, nutrition and toileting (Harnett 2010; Sandvoll et al.
874 2012), but do not always take a person-centred approach (McCormack 2016) in terms of their
875 activities. Nursing homes often lack the opportunity and time to offer activities for all residents
876 and their staff recognize that some residents may spend time sitting alone even though staff
877 members know that they might have preferred to join in activities (Sandvoll et al. 2015). Could
878 the lack of staff explain our study results? Our findings show that visits per month and ward type
879 had a significant effect on number of outdoor activities during the week. An increasing number

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883 of visits were associated with more trips outside the nursing home. This shows that the visits

884 (from family or volunteers) have an impact on resident's level of activities regarding outdoor

885 activity. In Norway, the government has addressed new ideas to solve the staff challenges and

886 suggests that voluntary contributions by relatives and organizations should be included as a way

887 of providing activities for nursing home residents (Det kongelige kulturdepartement 2018; Helse-

888 og omsorgsdepartementet 2013).

889   A reform to improve elderly care was introduced in a recent white paper from the Norwegian

890 government. One of the main areas that need improvement in elderly care is activities for elderly

891 people living in nursing homes and the white paper suggests that they should participate in one

892 hour of activity every day (Helse- og omsorgsdepartementet 2018). To provide more activities

893 for nursing home residents, particularly outdoor activities, nursing home staff should be given

894 resources to organize individual, person-centred and customized activities for all residents and to

895 co-ordinate voluntary contributions (e.g., from family members and elderly that want to

896 participate in activities). This is consistent with a recent study by Skinner et al. (2018), who

897 found that the voluntary, unpaid contribution took place within cultural, social and other

898 activities aimed at promoting mental stimulation and well-being. Furthermore, they suggested

899 that the staff in government nursing homes should consider voluntary contributions when they

900 plan the care of residents in long-term care (Skinner et al. 2018). To offer a variety of activities

901 for nursing home residents, activities should be offered both inside and outside the nursing home.

902 We also encourage the national authorities to specify in white papers that activities for

903 Norwegian nursing home residents should take place both indoors and outdoors. For residents

904 who are unable to go outdoors on their own, rickshaws might serve as an alternative way of

905 enabling them to go outdoors. Our findings show that nursing home residents rarely engage in

906 outdoor activities, even though the need for activities and engagement for nursing home residents

907 is well known internationally (Björk et al. 2017; Kjøs & Havig 2016; Lampinen et al. 2006a;

908 Palacios-Ceña et al. 2015; Theurer et al. 2015). Therefore, a greater focus on activities for

909 elderly nursing home residents should be increased and customized in line with each resident's

910 individual needs and wishes. Finally, our results show that the institution that the residents live in

911 has an important association with outdoor activity. This implies that organizational differences in

912 nursing homes might have an impact on outdoor activity, which is an important implication for

913 further research, health policy and practice.

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Deleted: with short-term ward type was negative, indicating that the residents in that ward type took significantly fewer trips outside the nursing home than did residents in the long-term ward. Our findings show that the number of visits and ward types had significant effects on the number of trips outside the nursing home during the week. Residents in dementia wards had more visits and took significantly more trips outdoor than did residents in long-term wards. …

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Strengths and weaknesses

The strength of this study is the systematic use of standardized, psychometric-tested instruments and measures (Mahoney & Barthel 1965). One weakness is related to the nursing students' observations used to rate ADL. One obligation of research is not to harm participations; i.e., even though self-report is recommended as the gold standard for gathering data (Polit & Beck 2017), self-report was considered to be inappropriate for assessing the ADL of these residents. The students' involvement in research might contribute to mutually strengthening research and education. The students used a predefined manual or standardized protocol to assess data, which is an advantage, particularly since the lecture was given immediately before clinical placement. The data collection was supervised by the university teacher and nurses working at the different nursing homes. This might, on the other side, be a bias in this study because the involvement might serve as a Hawthorne effect (Polit & Beck 2017). The participants represent a convenient sample from clinical placements where the university has contracts educating students. In such a way, it might be limited possibilities for generalization of the results to all nursing homes.

Conclusions

More than half (57%) of the participants in this study did not go outdoors during the preceding week. Their ADL status might explain this pattern because more than 50% of the residents had an ADL score <10, which indicates low performance status. The institutions that the residents live in have an impact on outdoor activity, which suggests that organizational differences matter. This is an important implication for further research, health policy and practice. Planning for nursing home residents' activities requires staff competence in assessing the capacity and needs of all residents. Those residents with few family members or friends might benefit from visits from volunteers taking on an important function in collaboration with the nursing staff in managing different kind of activities, such as outdoor activities. Our findings show that residents rarely engage in outdoor activities, even though the need for activities and engagement for nursing home residents is well known. Therefore, a greater focus on activities for elderly nursing home residents should be increased and customized in line with each resident's individual needs and wishes.

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