



# Voting Behaviour and Health Among the Oldest-old in Germany: Results from a Population-Based Cross-Sectional Study

Judith Wenner<sup>1,2</sup> · Michael Wagner<sup>1,3</sup>

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## Abstract

**Background** If voter turnout reflects social or health inequalities, then these inequalities can reduce equal political representation. Research suggests that poor health impedes voting and contributes to low turnout, especially among the oldest-old (80 years and older). Therefore, we examine the determinants of voting behaviour in more detail, with a special focus on the role of health status among the oldest-old. **Methods** The analysis was based on a population-based sample of older adults living in Germany's largest federal state, North Rhine-Westphalia (n=1826). The outcome was participation in the last federal election. As determinants, we included subjective, functional, mental, and cognitive health; mobility; institutional living; education; social embeddedness; party attachment; habituation; and conformist attitudes. We used logistic regression models to calculate odds ratios and 95% confidence intervals. **Results** The overall turnout rate was 84.6% (95%-CI:82.9–86.3), which shows that most of the oldest-old participate in elections. Results from logistic regressions revealed that lower formal education and limitations in functional, cognitive, and mental health were associated with lower odds of voting; while habituation, party attachment, and partnership were associated with higher odds of voting. **Conclusion** Most of the oldest-old in Germany participate in elections. Still, our results hint at the existence of important inequalities in turnout rates. Given that older adults constitute an increasing share of the electorate, and that those who are less likely to vote are often among those most directly affected by political decisions, all individuals who are willing and able to participate in elections should be given the necessary support to actually do so.

**Keywords** Political participation · Health inequalities · Socio-economic resources · Oldest-old · Germany

## Introduction

The oldest-old constitute increasingly large shares of European societies, including Germany (Eurostat, 2020). Their health and life conduct are important fields of research in social and health sciences (Erlinghagen & Hank, 2019; Wagner et al., 2018). One aspect of their life conduct is political participation (Nygård et al., 2015). International research on turnouts has repeatedly shown the inversely u-shaped association between age and turnout: the youngest and the oldest members of societies vote less often compared to the middle-aged. Given that the age differences in turnout are comparatively constant over time and place, this effect is somehow related to individual age and less likely attributable to cohort effects (Dassonneville, 2017; Goerres, 2007; Melo & Stockemer, 2014). There is evidence that ill health contributes to low turnout among the oldest-old (Gehring & Wagner, 1999; Mattila et al., 2013). Therefore, we will examine the determinants of voting behaviour, with a special focus on the role of health status among the oldest-old, using Germany as an example. Empirical research on the oldest-old is complicated by the fact that there is no generally accepted definition of this life period. The term “older adults” usually refers to persons of retirement age (around 65 years), but there is no such marker for the oldest-old (Kydd et al., 2020). Here, we refer to all persons aged 80 years and older as the oldest-old.

Lower turnout among the oldest-old may result from individual choices not to vote. Following a rational choice model, this seems to be well understandable in light of the limited effect of a single vote on the election results. However, as especially the oldest-old are likely to hold values of security and more traditional and conservative attitudes (Reissmann et al., 2021), they might feel a civic duty to participate in elections.

Other explanatory models and extensions of the pure rational choice model help to understand why individuals vote. In a meta-analysis of individual-level analyses of voting, Smets & van Ham (2013) refer to five other different models that help in explaining individual level voter turnout. First, the resource model – mainly developed by Verba and colleagues (1995) – proclaims that resources in very different forms (financial, educational, networks, time) increase the likelihood of voting. The resource model is of special importance from an inequality perspective. Differences in turnout rates that reflect social inequalities hint at systematic differences in people’s resources or barriers that, as a result, weaken equal political representation (Gagné et al., 2020; Verba et al., 1995). Age itself is also identified as one of the aspects that influence available resources and thereby turnout. Second, according to the mobilization model, turnout is influenced by the effort of parties, movements and other organizations to motivate and mobilize citizens or members to take part in elections. Close attachment through networks or membership in these groups therefore facilitates voting. Third, the socialization model proclaims that the influence of family, friends, school or media during childhood and youth has a long-lasting impact on voting behaviour in adulthood. Fourth, the psychological model considers a wide range of cognitive and personality characteristics that influences voting behaviour. These include cognitive ability, knowledge, or ideological preferences. Finally, the political-institutional model suggests that the political system itself influ-

ences the voting behaviour (e.g., through the organization of elections or compulsory voting). The last model is especially relevant for cross-national comparisons of turnout (Smets & van Ham, 2013).

The above elucidated models are complementary or even overlapping and not mutually exclusive. Empirical studies have identified support for single aspects of every model. However, the results of the meta-analysis underline the high relevance of the resource model. This also includes age (or age square) as an important predictor of turnout (Smets & van Ham, 2013).

Building on these more general models, specific explanations have been invoked to explain age differences in turnout and also different voting behaviours among older adults (Becker, 2002; Dassonneville, 2017; Goerres, 2007, 2010). These explanations can be broadly grouped into four different categories: explanations that consider the (1) health status, (2) the social embeddedness, (3) the habituation, or (4) the socio-economic resources of older adults.

**(1) Health status:** Several studies have explored the effects of health on voting and have found considerably lower turnout among individuals with poor general health (Denny & Doyle, 2007; Gagné et al., 2020; Mattila et al., 2013), limitations in functional health (Gagné et al., 2020; Gehring & Wagner, 1999), some chronic diseases (including dementia) (Gollust & Rahn, 2015; Sund et al., 2016), mental illnesses (Denny & Doyle, 2007; Sund et al., 2016), and disabilities (Schur et al., 2002). The findings of these studies support the theoretical assumption that voting behaviour is directly influenced by individuals' physical, mental, or cognitive resources. Moreover, the availability of these resources may also influence people's motivation to become active and engaged with societal questions (Gagné et al., 2020; Mattila et al., 2013). A more detailed look at the interaction between age and health indicates that the association between general health and voting behaviour is even stronger among older adults (Mattila et al., 2013) and undergoes considerable changes throughout the life course (Gagné et al., 2020).

**(2) Social embeddedness:** Social embeddedness through partnerships, friendships, or other social relations and activities also increases the likelihood of voting (Goerres, 2007; Smets & van Ham, 2013) and undergoes changes when people reach old age (Gagné et al., 2020; Nie et al., 1974). Examples are retirement, institutional living, and the deaths of friends or partners that can change an individuals' social relations and social embeddedness. In this context, the idea of a gradual disengagement needs to be taken into account (Cumming & Henry, 1961). Even though some aspects of the disengagement theory have been falsified empirically, old age is in many cases characterized by a decreasing network size and an increasing focus on fewer, but closer significant others (Carstensen, 1991; Wagner et al., 1999).

**(3) Habituation:** While health impairments and lower levels of social embeddedness are often cited in explanations of lower turnout among the oldest-old, there are other factors that can contribute to higher turnout in this group. In particular, habituation and agreement with the social norm of voting are said to increase turnout among older adults, including the oldest-old (Dassonneville, 2017; Goerres, 2010). With

increasing age, the likelihood to have participated in many elections and to have made a habit of voting increases. As with other actions, habits and routines reduce costs and facilitate the repetition of the same actions. As a result, voting is more likely with increasing age. In addition, older adults on average tend to adhere stronger to social norms compared to younger members of the electorate – probably as they have spent large parts of their lives in a particular society, which increases their identification with it. As voting is a strong social norm in many societies, older adults also have a stronger motivation to vote and thereby adhere to this social norm (Goerres, 2010).

**(4) Socio-economic resources:** According to the classical resource model of political participation, higher socio-economic status tends to be accompanied by more (cognitive and material) resources for participating in political processes and with more motivation to follow the social norms regarding voting (Brady et al., 1995). Higher education and status often go along with more powerful positions and with more wealth. Contributing to the stability of the social and political system through voting is thus of higher self-interest for individuals in these social positions than to marginalized members of the electorate. At the same time, high education and wealth lead to independence and might rather reduce the importance of stability and adherence to social norms (Goerres, 2010). Education plays a key role in these explanations. However, research suggests that life experience partly compensates for lower formal education in old age (Wolfinger & Rosenstone, 1980).

The validity of these explanations and the turnout levels among older adults are frequently analysed using data that either do not differentiate further by age or exclude the oldest-old (Dassonneville, 2017; Dormagen & Michel, 2018; Kobold & Schmiedel, 2018). In addition, individuals living in institutional settings or with severe health impairments are frequently excluded – or exclude themselves – from population-based surveys, which leads to biased estimates of turnout among the oldest-old (Dormagen & Michel, 2018, 2019; Schanze, 2019).

For Germany, only the Berlin Aging Study (BASE) has reported details on the turnout rates of the oldest-old. According to BASE, 88.3% of men and 89.3% of women aged 80–89 participated in the last elections. Among people aged 90 or older, the turnout rate decreased slightly for both sexes, to 84.0% for men and 80.0% for women (Gehring & Wagner, 1999). Other representative surveys (e.g., the German Aging Study or the European Social Survey) that investigate the voting behaviour include only few persons aged 80 years and older and do not include the institutionalized (13.7% in this study). They thus do not allow for detailed and representative analyses of turnout rates among the oldest-old. Surveys from other countries have reported similarly high turnout rates among the oldest-old (e.g., SWEOLD from Sweden or TriElec from France) (Dormagen & Michel, 2018; Fritzell et al., 2020).

According to the officially reported turnout figures for the last German federal election in 2021, 75.3% of people aged 70 or older voted (Der Bundeswahlleiter, 2022). Similar rates have been reported for previous elections (e.g., 75.8% in 2017). In the federal state of North Rhine-Westphalia (NRW), where the data for this study had been collected, the turnout among persons aged 70 years and older was 77.3% in 2017 and 2021 respectively (Der Bundeswahlleiter, 2018, 2022). While this rate

from the official election statistics is still high, it is lower than the levels cited in survey reports for Germany like BASE (Gehring & Wagner, 1999). This highlights the problem of biased survey data even when thorough sampling methods and recruitment strategies are applied. The differences between self-reported and documented turnout levels are large in many countries and suggest that social desirability and the social norm to vote lead to higher reported turnout in social surveys. A comparison of 14 (mainly European) countries showed that self-reported turnout rates in surveys ranged from 68.7 to 98.3%, while the officially documented turnout rates ranged from 45.2 to 94.3%. Country differences between self-reports and official statistics were between 5.0% and 30.0% (Mahler et al., 2014).

To study voting behaviour of the oldest-old and to reduce selection bias, we need data from surveys that apply specific recruitment strategies and that aim to include the oldest-old with health impairments. This will most likely reduce selection bias. Results from representativity analyses showed the success of these strategies for the Study on Quality of Life and Subjective Well-being of the Very Old in North Rhine-Westphalia (NRW80+) (Kaspar et al., 2022). However, information bias caused by socially desirability or recall errors in retrospective surveys leading to higher reported turnouts cannot be reduced by this approach and must be considered when interpreting the results.

## Methods

### Study design, setting, participants, study size

We based our analysis on data from the NRW80+-Study (Wagner et al., 2018; Zank et al., 2020). NRW80+ is a representative sample of very old persons (80 years or older) living in NRW, the largest German state. Data for the first wave were collected in 2017 and 2018. Several elements of the survey design facilitated the inclusion of hard-to-reach groups: the oldest age groups (85+) were oversampled; all interviews were conducted face-to-face in the homes of the participants; individuals living in institutional settings were explicitly included; and for individuals who were willing to participate but unable to respond themselves, close relatives or friends responded (proxy interviews) (Wagner et al., 2019). We excluded 36 participants with non-German nationality as they are excluded from voting in federal elections in Germany. The final sample used for this analysis includes 1826 persons. The study was carried out in accordance with the ethical standards of the ethics committee of the Medical Faculty of the University of Cologne and the Helsinki Declaration. Informed consent was obtained from all participants included in the study.

### Outcome variable

*Voting behaviour* was measured with the following question: “There are different reasons why some people nowadays don’t vote. What about you? Did you vote in the last federal elections?” (yes/no). As data collection started before the federal election in September 2017 (24.09.2017) and continued afterwards, not all participants

reported their voting behaviour for the same election. For 346 participants (16.9%), information on voting participation was inquired before the election in 2017. Thus, it referred to their participation in the 2013 federal election. For 175 participants, the voting behaviour in 2017 had been inquired in the second wave which took place in 2019/2020. The information from the second wave was therefore used instead. For the remaining participants with interviews in wave 1 (n=171) before the 2017 election, voting behaviour in the 2013 election is used as a proxy for their voting behaviour in 2017.

## Explanatory variables

*General (subjective) health* was measured with the question: “Overall, how would you rate your health during the past four weeks?” The responses were provided on a four-point scale (“very poor” to “very good”). *Functional health* was assessed based on the respondent’s ability to perform self-maintaining activities of daily living (ADL) (Lawton & Brody, 1969), including toileting, feeding, dressing, grooming, physical ambulation, and bathing. The possible responses for each activity were “only with assistance” (0), “with moderate assistance” (1), and “without assistance” (2). We used the responses to calculate mean ADL scores ranging from zero to two. Additionally, using a wheelchair (yes/no) was included as a measure of *mobility*. *Cognitive health* was assessed using the cognitive screening test DemTect, and the Global Deterioration Scale (GDS) in proxy interviews (Kalbe et al., 2004; Reisberg et al., 1982). The DemTect consists of five different tests of cognitive ability with a combined maximum score of 18. Scores between 13 and 18 indicate age-adequate cognitive functioning; scores between nine and 12 indicate mild cognitive impairment (MIC); and scores below nine indicate severe cognitive impairment. The GDS has seven stages ranging from “no cognitive decline” (1) to “very severe cognitive decline” (7). Like the DemTect results, the GDS results were categorised into age-adequate cognitive functioning (stages 1 and 2), MIC (stage 3), and severe cognitive impairment (stages 4 to 7). Additionally, *mental health* was assessed based on self-reported treatment for any mental illness (yes/no).

Being in a *partnership* (yes/no) and being *socially isolated* (yes/no) were used as measures of the degree of social embeddedness. People who reported living as a married, an unmarried, or a living-apart-together couple were coded as being in a partnership (Mauritz & Wagner, 2021). People were coded as socially isolated if they reported having regular contact with fewer than two important persons (Huxhold & Engstler, 2019).

As indicators for habituation, we used the respondents’ *primary location of residence* between 1949 and 1990 (within or outside West Germany/Federal Republic of Germany/FRG) (yes/no), and their self-reported *attachment to a political party* (yes/no). As a proxy for the respondents’ level of agreement with social norms regarding voting we used the question: “How important is it for you to *not offend anybody*?” The responses were provided on a four-point scale ranging from “not at all important” to “very important”. The question was formulated with reference to the *conformist* dimension of the Portrait Value Questionnaire (Schwartz, 2003).

As a measure of the available socio-economic resources we used the respondents' formal educational level based on the International Standard Classification of Education (ISCED) version 2011 (UNESCO, 2011). The educational levels were recoded into three categories: low (ISCED 0–2), middle (ISCED 3–4) and high (ISCED 5–8).

Age was measured using three categories (80–84 (=born 1933–37), 85–89 (=born 1928–32), 90+ years (=born before 1928)), and sex was reported as a dichotomous (female/male) measure. We assessed the respondents' form of housing based on whether they were living in an *institutional setting* (yes/no). We also included a dichotomous variable indicating whether the target persons replied to the questions themselves or were represented by a *proxy* (yes/no).

## Statistical methods

We first explored the associations between the explanatory variables and the respondents' voting behaviour using 95% confidence intervals (CI) and chi<sup>2</sup>-tests. We then used logistic regression models to calculate odds ratios and 95%-CI. For the categorical variables, the categories with the assumed highest turnout rates were used as the reference category.

Analyses were weighted to account for the sample design, and to increase representativeness of the results. Sample weights correct for design characteristics such as sample point, age, and sex, while calibration weights adjust for several social and demographic characteristics that influenced survey participation.

All explanatory variables were included in the final regression model. In addition, a step-wise approach to regression analysis was used to examine the different hypotheses (habituation, social embeddedness, socio-economic resources and health) and their combined impact on turnout in more detail. Multicollinearity was assessed based on the variance inflation factor (VIF).

Complete information was available for only 70.7% of the respondents. We therefore conducted multiple imputation (n=20) for all missing values and pooled the coefficients from the models (Rubin, 1976). In sensitivity analyses, we explored the effects of sex, imputation, the election year and the sampling strategy on the results. All regression analyses were based on the combined imputed datasets. Analyses were conducted using IBM SPSS Statistics 27.

## Results

The final (weighted) sample used for our analyses consisted of 1826 respondents, of whom 8.5% were surveyed through proxy interviews, and 13.2% were living in an institutional setting. 63.7% of the respondents were female and 36.3% male. The majority (52.5%) of the respondents were between ages 80–84, 30.4% were between ages 85–89, and the remaining 17.0% were aged 90 or older. On the outcome of voting behaviour, 84.6% (95%-CI:82.9–86.3) of the respondents reported that they participated in the last federal election. Voting behaviour was unknown for only 12 respondents (before imputation) (Table 1).

**Table 1** Sample description

		N or mean	% or SD
Voting	No	279	15.4%
	Yes	1530	84.6%
Age (in years)	80–84	958	52.5%
	85–89	555	30.4%
	90+	311	17.0%
Sex	Male	662	36.3%
	Female	1163	63.7%
Proxy interview	No	1669	91.5%
	Yes	155	8.5%
Institutional living	No	1575	86.3%
	Yes	250	13.7%
Subjective general health	Very bad	136	7.5%
	Rather bad	583	32.1%
	Rather good	913	50.2%
	Very good	187	10.3%
Functional health (ADL)		1.64	0.53
Wheelchair	No	1566	85.9%
	Yes	258	14.1%
Treatment for mental illness	No	1682	93.2%
	Yes	122	6.8%
Cognitive health	Age-adequate	1040	68.5%
	Mild cognitive impairment	234	15.4%
	Severe cognitive impairment	245	16.1%
Partnership	No	1078	59.2%
	Yes	744	40.8%
Social isolation	No	1381	75.9%
	Yes	440	24.1%
Party attachment	No	334	19.9%
	Yes	1348	80.1%
Not offending anybody	Not at all important	225	12.7%
	Less important	320	18.1%
	Rather important	561	31.7%
	very important	661	37.4%
Primary location (1949–1990)	Outside FRG	122	6.7%
	Within FRG	1693	93.3%
Education	Low	522	29.7%
	Middle	903	51.5%
	High	329	18.8%

*Data weighted; differences in total numbers are due to missing values*

Turnout rates differed significantly between subgroups of the population (Table 2). Turnout rates decreased with age, from 86.8% in the youngest age group (80–84) to 85.9% in the next-oldest age group (85–89) and to 75.3% in the oldest age group (90+). The differences between the 80–84 and the 85–89 age groups were rather small. A separate analysis by sex showed that the decrease in turnout with increasing age was stronger (and was only significant) among women (Fig. 1).



**Table 2** Associations between voting behaviour and explanatory variables

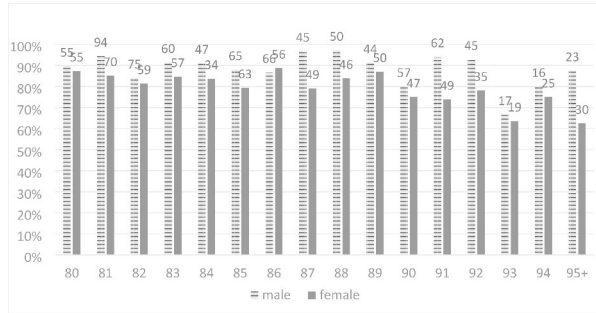
		N	%	95%-CI	
Age (in years)*	80–84	824	86.8%	84.6%	88.9%
	85–89	476	85.9%	82.8%	88.6%
	90+	231	75.3%	70.4%	80.1%
Sex*	Male	590	89.9%	87.3%	91.9%
	Female	940	81.6%	79.2%	83.7%
Proxy interview*	No	1464	87.9%	86.3%	89.4%
	Yes	67	46.4%	38.5%	54.7%
Institutional living*	No	1370	87.2%	85.5%	88.8%
	Yes	161	67.4%	61.5%	73.3%
Subjective general health*	Very bad	96	71.4%	63.1%	78.2%
	Rather bad	487	83.9%	80.7%	86.6%
	Rather good	770	85.3%	82.8%	87.5%
	Very good	173	92.7%	88.7%	96.0%
Functional health (ADL)*	Mainly depending on help	397	71.0%	67.2%	74.7%
	Partly depending on help	325	85.0%	81.2%	88.4%
	Mainly not depending on help	808	93.1%	91.3%	94.6%
Wheelchair*	No	1360	87.3%	85.6%	88.9%
	Yes	171	67.8%	61.9%	73.4%
Treatment for mental illness*	No	1453	86.7%	85.0%	88.3%
	Yes	68	59.0%	50.0%	67.8%
Cognitive health*	Age-adequate	947	91.1%	89.2%	92.7%
	Mild cognitive impairment	209	89.4%	84.9%	92.8%
	Severe cognitive impairment	131	55.9%	49.6%	62.2%
Partnership*	No	858	80.5%	78.1%	82.9%
	Yes	673	90.4%	88.2%	92.4%
Social isolation*	No	1191	86.7%	84.8%	88.4%
	Yes	336	77.8%	73.9%	81.7%
Not offending anybody*	Not at all important	159	71.6%	65.4%	77.2%
	Less important	289	92.0%	88.7%	94.7%
	Rather important	483	86.6%	83.5%	89.2%
	Very important	567	85.9%	83.1%	88.4%
Primary location (1949–1990)*	Outside FRG	88	72.9%	64.3%	80.1%
	Within FRG	1436	85.5%	83.8%	87.2%
Party attachment*	No	204	61.5%	56.1%	66.6%
	Yes	1225	91.5%	90.0%	93.0%
Education (ISCED)*	Low	389	75.6%	71.8%	79.2%
	Middle	779	86.8%	84.5%	88.9%
	High	313	95.1%	92.4%	97.1%

*N*=absolute number of persons who voted in each category; %=share of voters and 95%-confidence intervals in each category; weighted data; \**chi*<sup>2</sup>-test: *p*<0.01; differences in total numbers are due to missing values

The differences in turnout rates between the self-reports and the proxy interviews were large, with only 46.4% of individuals who participated in the survey through a proxy interview indicating that they voted, compared to 87.9% of those who self-reported. Similarly, turnout was found to be much lower among individuals who were living in institutional settings than among individuals who were living in private set-

**Fig. 1 Turnout according to age and sex (relative and absolute frequencies)**

1/ Data weighted; relative frequencies shown as sizes of columns/on y-axis; absolute frequencies shown in numbers above the columns; individuals aged 95 to 102 were analysed together due to their small numbers



tings (67.4% versus 87.2%). Turnout was also considerably lower among individuals without a partner; who were socially isolated; without party attachment; living mainly outside the FRG during the last decades; or had poor mental, cognitive, functional, or general health. The differences in turnout rates between respondents with different health statuses were huge. The largest difference was between respondents with age-adequate cognitive functioning (91.3%) and those with severe cognitive impairment (55.9%). Persons mainly independent from help (good functional health) reported much higher voting participation (93.1%) compared to persons depending partly (85.0%) or mainly (71.0%) on help. In descriptive analyses, using a wheelchair was associated with lower turnout (67.8%) when compared to persons not using a wheelchair (87.3%). Similarly, reporting a treatment for any mental illness was also associated with lower turnout (59.0%; no treatment: 86.7%). A high educational level was associated with high turnout (95.1%) compared to a middle or low educational level (86.8% and 75.6%, respectively).

Results from the fully adjusted regression model with imputed data and the subsequent step-wise regression analyses are presented in Table 3. Neither age nor sex were significantly associated with turnout. Participants included by means of proxy interviews had significantly lower odds of turnout. Their odds of voting were more than 50% lower compared to persons who responded themselves ( $OR=0.47$ ,  $p=0.01$ ). Institutional living was not associated with lower turnout in the full model. Except for general health, all of the health indicators were found to be significantly associated with turnout. Turnout was shown to increase continuously and strongly with increasing mean ADL ( $OR=2.22$ ,  $p<0.001$ ), which indicates that good functional health is strongly associated with increased turnout. The odds of voting were 65.0% lower among individuals with severe cognitive impairment than among respondents with age-adequate cognition ( $OR=0.35$ ,  $p<0.001$ ). Respondents treated for mental illness were considerably less likely to vote compared to respondents not treated for mental illness ( $OR=0.37$ ,  $p=0.002$ ). We also found that using a wheelchair increased the odds of voting by 93.0% ( $OR=1.93$ ,  $p=0.02$ ) in the full model. More differentiated analyses showed that functional health had the strongest impact on the reversal of the bivariate effect.

Social embeddedness also proved to be associated with turnout. Partnership had a strong and significant effect on turnout with 49.0% lower turnout among persons not being in a partnership ( $OR=0.51$ ,  $p=0.001$ ). The effect of social isolation, observed

**Table 3** Results from fully adjusted and step-wise logistic regression models (odds ratios)

	Full model	Demo-graphy	Health	Embed-dedness	Habituation
Age (in years) (ref. 80–84)	n.s.	n.s.	n.s.	n.s.	n.s.
85–89	1.51*	1.11	1.25	1.32	1.51*
90+	1.60	0.88	1.14	1.28	1.56
Sex (ref. male)	0.96	0.58**	0.57**	0.69*	0.75
Proxy Interview (ref. no)	0.47*	0.16***	0.60*	0.55*	0.49*
Institutional living (ref. no)	0.86	0.50***	0.88	1.07	0.87
Subjective general health (ref. very good)	n.s.		*	*	*
Very bad	0.46		0.34**	0.33**	0.43*
Rather bad	0.78		0.68	0.63*	0.72*
Rather good	0.53		0.57	0.53	0.51
Functional health (ADL)	2.22***		2.25***	2.25***	2.31***
Wheelchair (ref. no)	1.93*		1.74*	1.65	2.02*
Treatment for mental illness (ref. no)	0.37**		0.37***	0.38***	0.37**
Cognitive health (ref. age-adequate)	***		***	***	***
Mild cognitive impairment	0.96		0.92	0.95	0.88
Severe cognitive impairment	0.35***		0.24***	0.26***	0.31***
Partnership (ref. yes)	0.51***			0.59***	0.49***
Social isolation (ref. no)	0.76			0.66*	0.77
Not offending anybody (ref. very important)	*				*
Not at all important	0.47**				0.50**
Less important	1.95*				2.09*
Rather important	0.91				0.95
Primary location (ref. within FRG)	0.54*				0.48**
Party attachment (ref. yes)	0.15***				0.16***
Education (ISCED) (ref. high)	*				
Low	0.30**				
Middle	0.48*				
Constant	23.854	11.035	5.599	7.639	12.847
N	1,826	1,826	1,826	1,826	1,826
Nagelkerke R <sup>2</sup>	0.405	0.151	0.271	0.285	0.326
Model sig. (chi <sup>2</sup> )	>0.001	>0.001	>0.001	>0.001	>0.001

\* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$ ; data weighted; for categorical variables with more than two categories (age, subjective health, cognitive health, not offending anybody, education) combined significance ( $p$ -value) is assessed in first row (n.s.=not significant)

in a bivariate analysis disappeared in the final model after controlling for habituation and socio-economic resources.

All three indicators for habituation showed significant associations with turnout. Persons for whom not offending anybody is not at all important had 53.0% lower odds of voting (OR=0.47,  $p=0.002$ ) while persons for whom this was less important showed 95.0% higher odds of voting (OR=1.95,  $p=0.021$ ) compared to persons for

whom not offending anybody is very important. Persons who mainly lived outside the FRG in the last elections ( $OR=0.44$ ,  $p<0.01$ ) and persons without a general party attachment ( $OR=0.15$ ,  $p<0.001$ ) showed 56.0% and 85.0% lower odds of voting respectively.

Educational level was strongly associated with turnout. Persons with low formal educational level had 70.0% lower odds of voting ( $OR=0.30$ ,  $p=0.001$ ) and persons with middle educational level 52.0% ( $OR=0.48$ ,  $p=0.024$ ) lower odds of voting compared to persons with higher education.

By means of step-wise regression analyses we explored the relevance of the health indicators and the combined impact of the different hypotheses in more detail. Looking only at the demographic and design variables, participating through proxy interviews showed a much stronger association with turnout than in models including health indicators. For persons living in institutions, the effect on turnout disappeared completely when including the health variables. Excluding or including variables on social embeddedness and habituation did not change any of the associations between health and turnout. The step-wise regression showed that the effect of partnership is much stronger than the effect of social isolation in all models. Including educational level in the model made a difference for the association between subjective health and turnout. After controlling for educational level in the final model, the effect was less strong and no more significant.

Model fit and the relevance of the full model in explaining turnout was found to be acceptable based on a (Nagelkerkes) Pseudo- $R^2=0.405$ , a non-significant Hosmer-Lemeshow test ( $p=0.26$ ), and only two extreme cases in the fully adjusted model. The assessment of multicollinearity showed VIF below 2.5 for all variables and thus none of the variables had to be excluded.

The sensitivity analyses largely confirmed the results. Separate analyses of the sample by sex did not lead to meaningful changes in any of the observed effects. However, some of the effects were no longer significant – especially in models including only men (Online Resource 1). When we compared the results based on imputed and non-imputed data, the differences were also rather small, with minor changes in ORs and some changes in the results of significance testing (Online Resource 1). We also repeated the analysis while excluding individuals who are frequently not represented in surveys among older adults because they are not able to reply themselves, live in institutional settings, or have severe cognitive impairments. This led to an estimated overall turnout rate of 92.0% (95%-CI: 89.9–94.0), which is 7.4% higher than in the full sample. Finally, to make sure that using voting behaviour in 2013 as a proxy for voting behaviour in 2017 was acceptable, we repeated the analysis excluding persons for whom information was only available for the federal election is 2013. We did not observe any considerable changes in effects or significance testing.

## Discussion

Our analyses have added important knowledge to the study of voting behaviour among the oldest-old in Germany and beyond. The overall turnout rate we observed was 84.6%, which is relatively high, and shows that most of the oldest-old exercise

their right to vote. However, looking at the four different explanations for turnout among subgroups of the oldest-old (health, social embeddedness, habituation, and socio-economic resources) we also found considerable differences that hint at the existence of major inequalities.

The results highlight the importance of *health* in explaining turnout among the oldest-old. The lowest turnout rate (55.9%) was observed among individuals with severe cognitive impairment (indicating dementia). While this rate was considerably lower than the overall turnout rate, it shows that more than half of the oldest-old adults with a high risk for dementia still voted. As no single aspect of health masked all the others, functional health, cognitive impairment, and mental health each predicted turnout independently. After including these more specific health variables in the analysis and controlling for educational level, general (subjective) health was no longer shown to be significantly associated with turnout. A similar pattern was observed for institutional living, which was no longer associated with turnout in the full model. Thus, it appears that it is not institutional living as such that keeps older adults from voting, but the health conditions generally associated with the need for institutionalisation. Contrary to our expectations, we found that using a wheelchair was positively associated with turnout: i.e., that all other health and social factors being equal, using a wheelchair facilitated voting. The reversal of the bivariate association that showed lower turnout for persons using a wheelchair, however, was only observed in models that included all health indicators – with functional health having the strongest impact on this reversal. This result suggests that the role of mobility in voting is not yet fully understood. One possible explanation for this finding is that with equal functional health, being able and motivated to use a wheelchair is also a marker of resources and motivation to vote. Another explanation is that postal voting makes (limited) mobility less relevant. In 2017, 35.1% of all voters aged 70 or older opted for postal voting (Kobold & Schmiedel, 2018). The low turnout among persons included by means of proxy interviews is largely attributable to their worse health status. However, the effect remains after adjusting for health variables. Possible explanations are that we did not cover all aspects of health that might differ between persons included by self-reports and proxy-reports or that in proxy interviews recall bias and bias caused by social desirability were lower.

With regard to *social embeddedness*, the results were more nuanced. Having a partner was shown to be associated with higher turnout, which supports the hypothesis that social embeddedness increases the motivation to vote (Goerres, 2010; Smets & van Ham, 2013). As social isolation was not found to be significantly associated with voting behaviour in the fully adjusted models, it appears that the number of other regular social contacts was less relevant for turnout than being in a partnership. A potential explanation for this finding is that the partner supports the individual's decision-making and voting processes, or exerts a form of social control (Rubenson et al., 2004). In addition, having a partner was more relevant for women than for men, as shown by the separate analyses. The importance of social embeddedness in explaining turnout was thus partly confirmed.

Living in the FRG for many years – and thus having had the opportunity to vote in many previous elections – and feeling attached to a specific party considerably increased the odds of voting. An inconclusive pattern was found for conformist

attitudes, with only extreme non-conformist attitudes decreasing turnout. Especially *habituation* was found to considerably increase the odds of voting, and partly explained why turnout was still high among the oldest-old, despite existing health impairments.

Finally, our results indicate that the classical *socio-economic resources* hypotheses of political participation also apply to the oldest-old, i.e., that social inequalities in voting – as measured based on the educational level – persist into old age. As this association was found to persist after controlling for health status in the fully adjusted models, it appears that there was both a direct impact of social inequality on turnout, and an indirect impact on turnout through health status, which is also generally influenced by socio-economic resources.

Our findings on these four hypotheses are in line with evidence from available studies on determinants of voting behaviour. The importance of cognition (Gehring & Wagner, 1999; Sund et al., 2016) and functional (Gagné et al., 2020; Gehring & Wagner, 1999) and mental health status (Denny & Doyle, 2007) has been described in other studies, albeit without a specific focus on very old adults. General health has also been found to be relevant for turnout (Denny & Doyle, 2007; Gagné et al., 2020; Mattila et al., 2013). In our study, this effect disappeared when controlling for more specific health indicators. In contrast to findings from the Berlin Aging Study (Gehring & Wagner, 1999), we did not find an additional effect of institutional living when controlling for health status. A possible explanation for this discrepancy is that the composition of the sub-population of institutionalised older adults differs in both studies. For example, the introduction of the statutory nursing care insurance in 1995 made institutionalized care affordable to larger shares of the population. Institutionalization is also associated with poorer health today compared to the 1990s as the options for ambulatory care have increased (Jacobs et al., 2018). In addition, BASE included only persons living in Berlin while the NRW80+-study includes persons living in small cities and rural areas as well, which may help explain differences in the composition of the institutionalized population.

The effects of social embeddedness and habituation on high turnout have also been stressed in other studies (Gagné et al., 2020; Goerres, 2007; Nie et al., 1974; Smets & van Ham, 2013), and both factors also have special relevance in old age. The strong association between educational level and voting behaviour we found in our analysis is consistent with the results of other studies on social inequalities in voting (Gehring & Wagner, 1999; Goerres, 2007; Rubenson et al., 2004).

Our results show that the four different hypotheses (health, social embeddedness, habituation, and resources) complement each other and constitute independent and individually relevant explanations for turnout among the oldest-old. Health status is highly relevant in explaining turnout among the oldest-old, but does not superimpose other relevant determinants like resources or habituation.

While our results are largely comparable to those of other surveys that also reported high turnout rates among the oldest-old (Dormagen & Michel, 2018; Fritzell et al., 2020; Mahler et al., 2014), the observed turnout rate is 7.3% points higher than in the official reporting for the persons aged 70 years and older in NRW for 2017 (84.6% vs. 77.3%) (Der Bundeswahlleiter, 2018). This hints at remaining bias in the sample. It has been shown that people who participate in elections are also more likely to par-

ticipate in surveys. This observation helps to explain the biased results on turnout in surveys, and is especially relevant among the oldest-old (Dormagen & Michel, 2018; Schanze, 2019). In addition, the survey period was during the time of the election. Acute health problems among this age group might have simultaneously impeded voting and participation in the survey. Conducting proxy interviews and including institutionalised and cognitively impaired persons were suggested as potential strategies for reducing this bias (Schanze, 2019). These strategies were implemented in the NRW80+-sample and reduced the bias and the overestimation of turnout by 7.3% as our sensitivity analysis has shown. Even though proxy respondents might not always be able to give the exact answers, we considered it reasonable to include their answers in order to increase the representativity of the sample and reduce selection bias (Kaspar et al., 2022).

In addition to the risk of selection bias, it is well known that respondents tend to give socially desirable responses on their voting behaviour. The remaining difference of 7.3% between the observed turnout and the officially documented turnout is thus most likely due to the social desirability bias. This bias is well known to contribute to overestimates of turnout rates in surveys (Karp & Brockington, 2005). In addition, a fragmentary memory of the voting behaviour in the last election is a source of information bias that must be considered especially for persons with cognitive impairments. Compared to other surveys for which up to 30.0% differences between self-reported and documented turnout have been observed, the 7.3% difference that we found in our analysis is rather at the lower end (Mahler et al., 2014). Minor information bias might also be caused by persons who referred to the election in 2013 while their health status was inquired in 2017/18. However, among persons who reported their voting behaviour twice in our study (in the first wave for 2013 and in the second wave for 2017), only 14 out of 173 changed their voting behaviour. Results from sensitivity analysis excluding persons for whom voting behaviour in 2013 was used as a proxy did not change the results. Thus, voting behaviour seems to be rather constant over time in our sample and we therefore consider the voting decisions in 2013 an acceptable approximation of the voting behaviour in 2017.

To sum up, our analysis has shown that most of the oldest-old in Germany participate in elections. However, social and health inequalities lead to different levels of turnout. Older adults make up an increasing share of the electorate and all individuals in this age group who are willing and able to participate in elections should be given the necessary support to actually do so. Our results show that physical and cognitive health impairments are the major reasons why the oldest-old refrain from voting. At the same time, a relevant share of the oldest-old exert their right to vote even with health impairments – especially when they have a high educational status, developed the habituation to vote during their life course and are socially embedded. Thus, interventions to promote political participation in all educational groups during the life course and to reduce social isolation in old age also promotes equal political participation in old age.

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**Data Availability** The data underlying this article are available in the GESIS Data Archive at <https://doi.org/10.4232/1.13527>. Data used from the panel study are soon available from the same repository or at reasonable request from the authors.

## Declarations

**Competing Interests** The authors have no relevant financial or non-financial interests to disclose.

**Ethics Approval** The study was approved by the Ethics Committee of the Medical Faculty of the University of Cologne (No. 17–169).

**Consent** Informed consent was obtained from all participants or their legal representatives.

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## Authors and Affiliations

Judith Wenner<sup>1,2</sup> · Michael Wagner<sup>1,3</sup>

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✉ Judith Wenner  
judith.wenner@uni-koeln.de  
Michael Wagner  
mwagner@wiso.uni-koeln.de

- <sup>1</sup> Cologne Center for Ethics, Rights, Economics, and Social Sciences of Health, University of Cologne, Cologne, Germany
- <sup>2</sup> Faculty of Human Sciences, Rehabilitative Gerontologie, University of Cologne, Universitätsstr. 91, 50931 Cologne, Germany
- <sup>3</sup> Faculty of Management, Economics and Social Sciences, Institute of Sociology and Social Psychology (ISS), University of Cologne, Cologne, Germany