Folkhälsomyndigheten
PUBLIC HEALTH AGENCY OF SWEDEN

Protection by a third and fourth dose of vaccine against COVID-19 among persons aged 65 years and older

Based on Swedish data from February to August 2022

Article number: 22266.

About this publication

This study is a follow-up to the report published on June 2, 2022 (in Swedish), in which the Public Health Agency of Sweden analysed the protective effective of a third and fourth dose of vaccine against COVID-19 among persons aged 65 years and older in Sweden. This follow-up report focuses primarily on vaccine effectiveness after the fourth dose (the second booster) over time. The purpose of this analysis was to evaluate the duration of the protective effect against severe outcomes, especially serious illness and death due to COVID-19. To compensate for the expected waning effects after the fourth dose (the second booster), the Public Health Agency of Sweden has recommended an additional fifth dose (the third booster) to all persons aged 65 years and older and people in risk groups.

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Abbreviations

CI	confidence interval
HR	hazard ratio
ICU	intensive care unit
Navet	a system including data on vital status at the Swedish Tax Agency
NVR	National Vaccination Register
SmiNet	a national electronic system for communicable diseases surveillance
SoL	National Register of Interventions in Municipal Health Care
SÄBO	care home
PAR	National Patient Register
PCR	polymerase chain reaction
RTB	Total Population Registry
SIR	the Swedish Intensive Care Registry
VE	vaccine effectiveness

Glossary

Confirmed case	PCR-confirmed SARS-CoV-2 or cases positive by rapid antigen tests. Cases detected through screening or contact tracing are included, and also symptomatic and asymptomatic infections
COVID-19 vaccines	refers to all vaccines given against COVID-19, mainly from AstraZeneca, Pfizer, Moderna and Novavax CZ
Death with COVID-19	death within 30 days after a positive SARS-CoV-2 test (not necessarily deaths *from* COVID-19)
First booster	first dose of vaccine after completion of primary course (a third vaccine dose)
Hospitalisation	inpatient care with COVID-19 as the principle diagnosis
Intensive care	Intensive care related to COVID-19
Previous infection	a positive COVID-19 test reported to reportable disease register
Prioritised testing	from February 2022, specific groups are tested for SARS-CoV-2. Individuals 65 years of age and older living in care homes or receive home help services are included
Second booster	second dose of vaccine after completion of primary course (a fourth dose of COVID-19 vaccine)
Third booster	third dose of vaccine after completion of primary course (a fifth dose of COVID-19 vaccine). Recommended to persons aged 65 and above from September 1, 2022
Unvaccinated	no vaccination registered in the National Vaccine Register
Vaccine effectiveness	1−hazard ratio×100%

Summary

This report presents an analysis of COVID-19 vaccine effectiveness (VE) after a fourth dose in relation to SARS-CoV-2 infection and severe outcomes due to the omicron variant among persons aged 65 years and older in Sweden. The purpose was to evaluate the duration of the protective effect, compared to unvaccinated individuals.

A nation-wide, register-based study followed a cohort from February 4, 2022 until August 18, 2022, which provides a follow-up period of up to six months. The vaccination strategy in Sweden prioritised those aged 65 years and older who live in care homes or receive home help services followed by persons aged 65 years and older without long-term care.

Individuals were divided into four subgroups, based on the timing of vaccination against COVID-19:

1. Persons who live in care homes,
2. Persons who receive home help services,
3. Persons 80 years of age and older not living in care homes or receiving home help services, and
4. Persons 65–79 years of age and older not living in care homes or receiving home help services.

The results of this study suggest that protection against hospitalisation remained high for more than 120 days after the forth dose in all four subgroups. For group 1–3, VE was about 95% compared to unvaccinated individuals. For group 4, VE, compared to unvaccinated individuals, waned to 83% (95% CI: 74−89%) after more than 90 days, but this result may be partly underestimated because community testing stopped during the study period.

For group 1, the initial VE against mortality (death within 30 days after confirmed SARS-CoV-2) was 96% (95% CI: 94−98%) day 14 to day 30 after a fourth dose. After 150 days, the protection had waned to 88%, compared to unvaccinated individuals.

The protection against intensive care and/or mortality was about 90% (95% CI: 77−98%) 90 days or more after the fourth dose among persons with home care services or those aged 80 years and older in group 3, compared to unvaccinated. The results for persons in group 4 was lower; 90 days or more after the fourth dose the corresponding effectiveness was 70%, but the confidence interval was wide (95% CI: 53−80%) and the results should therefore be interpreted carefully. This might be an effect of reduced community testing as faster waning of protection in a younger age group is less likely.

Other countries have published similar results regarding an initial increased VE after a fourth dose (a second booster) among older persons. However, evidence

regarding the duration of protection after four doses, compared to unvaccinated individuals, is so far limited. The results observed in our study follow a similar pattern as after the third dose. The protection against severe outcomes due to COVID-19 wane slowly at 120 to 150 days after the fourth dose. From September 1, 2022 the Public Health Agency of Sweden recommends an additional, fifth dose for all persons 65 years of age and older and people in risk groups to compensate for the expected waning effect of the fourth dose.

Sammanfattning

Rapporten presenterar resultaten från en analys av skyddseffekten efter vaccindos fyra mot covid-19 med fokus på allvarlig sjukdom och död. Studieperioden omfattar 4 februari till 18 augusti 2022, vilket innebär en uppföljningstid på upp till sex månader. Studien fokuserar enbart på personer 65 år och äldre, eftersom dessa prioriteras högst i turordningen för vaccination mot covid-19 i Sverige. Dessutom har provtagningsindikationen för personer på särskilt boende för äldre personer (SÄBO) eller med hemtjänst varit densamma under hela pandemin. Det har därför varit möjligt att även analysera skyddseffekt mot bekräftad covid-19-infektion, oavsett allvarlighetsgrad, i dessa två grupper.

Alla personer 65 år och äldre delades in i fyra grupper, baserat på i vilken ordning de har erbjudits vaccination:

5. personer boende på SÄBO
6. personer som har hemtjänst
7. personer 80 år och äldre utan hemtjänst eller SÄBO
8. personer 65–79 år utan hemtjänst eller SÄBO.

Rapporten togs fram för att få en bild av hur skyddseffekten efter en fjärde dos vaccin avtar över tid inför att Folkhälsomyndigheten sedan den 1 september 2022 rekommenderar en femte dos vaccin mot covid-19 till samtliga personer 65 år och äldre samt personer i riskgrupp.

Mer än 120 dagar efter dos fyra var skyddet mot att behöva vårdas på sjukhus med covid-19 som huvuddiagnos fortfarande mycket hög (omkring 95 %) i grupp 1–3. För grupp 4 avtog effekten till 83 % (95 % CI: 74−89 %) efter mer än 90 dagar.

För personer med hemtjänst och övriga 80 år och äldre var skyddseffekten mot iva-vård och/eller att avlida med covid-19 omkring 90 % (95 % CI: 77−98 %) från och med dag 90 efter dos fyra, jämfört med helt ovaccinerade personer. För övriga 65−79 år var skyddet 70 % efter mer än 90 dagar, dock med mycket brett konfidensintervall (95 % CI: 53−80 %).

Att skyddseffekten avtar något snabbare i den yngsta av de studerade åldersgrupperna kan till dels bero på den minskade provtagningen efter februari 2022, då skillnader mellan vaccinerade och referensgrupp kan påverkas av ett större mörkertal av icke rapporterade infektioner.

Skyddet mot att avlida med covid-19 inom 30 dagar för personer på SÄBO var 96 % (95 % CI: 94−98 %) den allra första tiden efter fjärde dosen (dag 14−<30) för att efter mer än 150 dagar ha sjunkit till 88 % (95 % CI: 82−92 %), jämfört med helt ovaccinerade personer.

Resultaten för det initiala skyddet efter fyra doser ligger i linje med andra länders studier av skyddseffekten den allra första tiden efter dos fyra. Det finns i nuläget ett

begränsat antal studier som haft lika lång uppföljningstid efter dos fyra som Folkhälsomyndigheten har i denna rapport och som har helt ovaccinerade personer som referensgrupp. De resultat vi observerade följer samma mönster som för tre doser över tid, det vill säga att skyddseffekten efter en påfyllnadsdos är hög mot allvarlig sjukdom och död och avtar långsamt först efter fyra månader.

Background

Previous studies suggest that the protection vaccination provides against severe outcomes of COVID-19 gradually wanes over time. Therefore, additional boosters are essential to restore protection. Even minor decreases in VE in risk groups may result in an increase in severe disease and death [1]. Therefore, from September 1, 2022, the Public Health Agency of Sweden recommends that all persons aged 65 years and older and people in risk groups receive an additional, third booster (a fifth vaccine dose) to maintain a high level of protection.

Purpose

The purpose of this study was to analyse waning VE after the fourth dose against severe outcomes after confirmed COVID-19 among persons 65 years of age and older in Sweden. The study also aimed to evaluate the remaining protective effect of a fourth dose when the recommended fifth dose for this age group was distributed beginning on September 1, 2022. Since Sweden was one of the first countries to recommend a fourth dose for persons aged 65 years of age and older, the follow-up time for the cohort in this study is relatively long, reaching up to six months.

Methods

A nation-wide, register-based cohort was constructed. From the Total Population Registry, individuals who were 65 years of age or older and living in Sweden on December 31, 2021 were included in the cohort. Data were linked to the National Vaccination Register (all COVID-19 vaccinations), Navet (vital status), SmiNet (data on confirmed cases of SARS-CoV-2), the Swedish Intensive Care Registry, the National Register of Interventions in Municipal Health Care (information about potential care home or home help services), and the National Patient Register (inpatient care). The study period was February 4, 2022 - August 18, 2022. The start date was set 14 days after the introduction of the fourth dose for individuals 65 years of age or older. Due to a reporting delay in the National Patient Register, data for the outcome hospitalisation could only be included up to July 15, 2022.

Data were divided into four subgroups, based on the timing of vaccination against COVID-19:

1. Persons who live in care homes
2. Persons who receive home help services
3. Persons 80 years of age and older not living in care homes or receiving home help services
4. Persons 65–79 years of age and older not living in care homes or receive home help services.

The following criteria defined vaccine dose three and four:

- A third dose (a first booster): the first dose registered on September 2, 2021 or later with a minimum of eight weeks since a second dose
- A fourth dose (a second booster): the first dose registered from January 21, 2022 or later with a minimum of eight weeks since the third dose.
- All combinations of vaccine types were included in the analyses.

The following categories defined the time since vaccination with a fourth dose in groups 1–3:

Four doses and

- at least 14 days but less than 30 days
- at least 30 days but less than 60 days
- at least 60 days but less than 90 days
- at least 90 days but less than 120 days
- at least 120 days but less than 150 days, and
- at least 150 days.

In April 2022, the Public Health Agency of Sweden recommended a fourth dose for individuals in group 4. These participants had been vaccinated with a fourth dose for a shorter period of time compared to persons in groups 1–3. Therefore, the last time-since-vaccination category was set to at least 90 days. For the same reason, these analyses also included a category of three doses and at least 90 days.

In all analyses, the reference group was unvaccinated individuals with no previously confirmed SARS-CoV-2 infection.

For analyses where the outcome was hospitalisation and the study period ended on July 15, 2022, the last category of vaccine status was 120 days or more.

During the study period, participants could contribute person-time to different time-since-vaccination categories until the occurrence of an event (i.e., the date of a positive SARS-CoV-2 test, the day before a fifth dose, or date of death) or until the end of follow-up, whichever came first.

Individuals were excluded if they had a documented SARS-CoV-2 infection before the start of follow-up or had received only one to three doses of vaccine (except for group 4, where individuals with one to two doses were excluded). Those vaccinated with four doses were included 14 days after the date of the vaccination.

For persons in group 1, the outcomes were:

- confirmed COVID-19 infection
- hospitalisation or death with COVID-19 within 30 days after a positive test

Since intensive care was rare in group 1, analysing this outcome was not relevant.

Outcomes analysed in group 2 were:

- confirmed COVID-19 infection
- hospitalisation due to COVID-19 infection
- intensive care and/or death with COVID-19 within 30 days of a positive test
- For individuals in groups 3 and 4, the following outcomes were analysed:
- hospitalisation due to COVID-19 infection
- intensive care and/or death with COVID-19 within 30 days of a positive test

Considering the current testing strategy, analysing effectiveness against COVID-19 infection was not possible in groups 3 and 4 [2].

To compare the risk of SARS-CoV-2 infection, hospitalisation, intensive care or death based on vaccination status (three/four doses vs. unvaccinated) Cox proportional hazards regression was used to calculate hazard ratios (HR) with 95% confidence intervals (CI). The analyses were adjusted for age and sex. Vaccine effectiveness was calculated as 1−adjusted hazard ratio×100%.

Analyses were performed in SAS Version 9.4 (SAS Institute, Cary, NC).

Results

Protection against infection

For individuals living in care homes or receiving home help services (groups 1 and 2), the fourth dose increased VE against infection, which remained at a high level (between 84 to 93%) until 119 days. After 150 days or more following the fourth dose, VE waned to 60% (95% CI: 53−66%) among individuals living in care homes, and to 58% (95% CI: 50−64%) among those receiving home help services, compared to unvaccinated (Figure 1a and 2a).

Protection against hospitalisation

Among individuals living in care homes, VE against hospitalisation was over 95% even 150 days or more after receiving the fourth dose, compared to unvaccinated individuals (Figure 1b).

For those receiving home help services, the initial VE against hospitalisation after the fourth dose was 93% (95% CI: 90−95%) in relation to unvaccinated individuals. Then VE increased to 96% (95% CI: 94−97%) and remained at that level until day 119 after the fourth dose. The VE declined marginally to 94% (95% CI: 88−97%) at 120 or more days after dose four (Figure 2b).

Even among persons 80 years of age and older who did not live in care homes or receive home help services, the protective effect against hospitalisation was very high: at 120 days or more after the fourth dose VE was estimated to be 96% (95% CI: 92−98%) (Figure 3a).

For those aged 65−79 years and not living in care homes or receiving home help services, the VE against hospitalisation was estimated to about 95% (95% CI: 92−97%) after the fourth dose, which then waned to 83% (95% CI: 74−89%) after 90 days or more, compared to unvaccinated individuals. This latter value was similar to the VE 90 days or more after the third vaccine dose in this group (Figure 4a).

Protection against intensive care and/or mortality

The VE against intensive care and/or mortality was 95% until day 119 after the fourth dose in groups 2−3 (individuals receiving home help services or persons 80 years of age and older who did not live in care homes or receive home help services). This waned to 90% (95% CI: 77−98%) at 120 or more days after receiving the fourth dose, compared to unvaccinated individuals (Figure 2c and 3b).

Among individuals in group 4 (persons 65–79 years of age and older not living in care homes or receiving home help services), the initial VE against intensive care/mortality was 88% after the fourth dose, compared to unvaccinated individuals. At 30–<60 days after dose four, VE increased to 94% (95% CI: 89−97%).

Thereafter, the protective effect against intensive care and/or mortality subsequently waned to 82% (95% CI: 71−89%) and 70% (95% CI: 53−80%) after 60–<90 days and ≥90 days, respectively, following receipt of the fourth dose. The confidence intervals were, however, wide. A similar result, VE: 62% (95% CI: 47−72%), was noted ≥90 days after the third dose for group 1 (individuals living in care homes), also with a wide confidence interval (Figure 4b).

Protection against mortality

VE against mortality within 30 days after confirmed SARS-CoV-2 infection was only analysed for individuals in care homes (group 1). Until day 119 after the date of a fourth dose, VE was 95% or higher (95% CI: 92−99%) while at day 120 to 150, vaccine effectiveness was 90% (95% CI: 86−97%), and at 150 days or more, VE was 88% (95% CI: 82−92%) (Figure 1c).

Discussion

In June 2022, the Public Health Agency published a report on vaccine effectiveness over time following a third dose and a first estimation of VE after the fourth dose for the same cohort (i.e., all persons aged 65 years and older in Sweden) (in Swedish). In summary, VE against admission to hospital, intensive care and death with COVID-19 was approximately 83% 60 days after the third dose in all subgroups and increased to 92% or more shortly after dose four [3].

The results of our updated analyses confirm that a fourth dose enhances the protective effect against severe outcomes and that VE remains high several months later. Compared to unvaccinated individuals, VE started waning four months after dose four. In order to maintain high levels of protection against severe outcomes, from September 1, 2022, the Public Health Agency of Sweden recommends that all persons aged 65 years and older and people in risk groups receive a fifth dose during the autumn of 2022 (a third booster) [4].

Globally, Sweden was one of the first countries (in February 2022) to recommend that older individuals and persons in medical risk groups receive a fourth dose (a second booster) against COVID-19. In our study, we provide results of the long-term effectiveness after four doses of vaccine; for two of the analysed groups follow-up time was as long six months. Studies examining the effectiveness of a fourth dose (a second booster) over time in relation to being unvaccinated are, so far, scarce [1,5]. However, some register-based studies have analysed four doses of vaccine in relation to three doses and the results indicate that the fourth dose increases protection against severe outcomes for several months [5–9].

Compared to being unvaccinated, a fourth dose reinforces high levels of protection against severe disease and death for several months before waning of the effect starts to occur. Vaccine effectiveness in our study remained high (88 to 95%) 150 days or more after a fourth dose of vaccine.

Regarding protection against SARS-CoV-2 infection due to Omicron, previous studies have observed that it declines rapidly with time since the last vaccination [1,3,5,9]. In our study, the waning effect against a breakthrough infection in the two first groups (where this was possible to analyse), was moderate but clearly waned faster than the protection against more serious outcomes.

The data underlying this study are based on high quality registers with national coverage. This study has, however, some limitations. First, we had no access to data describing comorbidities, socioeconomic factors or country of birth. Adjustments for these potential confounders was not possible. Second, it was not possible to adjust for calendar time. Third, some level of underestimation may have occurred in the outcomes of hospitalisation and mortality due to reporting delays. Finally, given the current community testing strategy, more COVID-19 infections occurred during the study period than were notified to the communicable diseases

reporting system (SmiNet). This limitation affects the results in groups 3 and 4 where any unreported cases would not be censored.

The lower levels of protection observed in group 4 (individuals aged 65–79 years not living in care homes or receiving home help services) were somewhat unexpected as they presumably are younger and healthier compared to the other age groups in this study. A shorter follow-up time (the last group to receive dose four during the study period) and severe outcomes being rarer in this group may contribute to the difficulty in detecting differences to the reference group.

The risks of hospitalisation and mortality after a COVID-19 infection are lower still among younger age groups, making it even more difficult to demonstrate statistically significant vaccine effectiveness. However, it is more than likely that VE is higher among younger compared to older individuals and studies provide evidence of this [1,5,9].

Appendix

Individuals aged 65 years and older living in care homes

Figure 1a. Vaccine effectiveness against COVID-19 infection after the fourth dose among individuals 65 years of age and older living in care homes

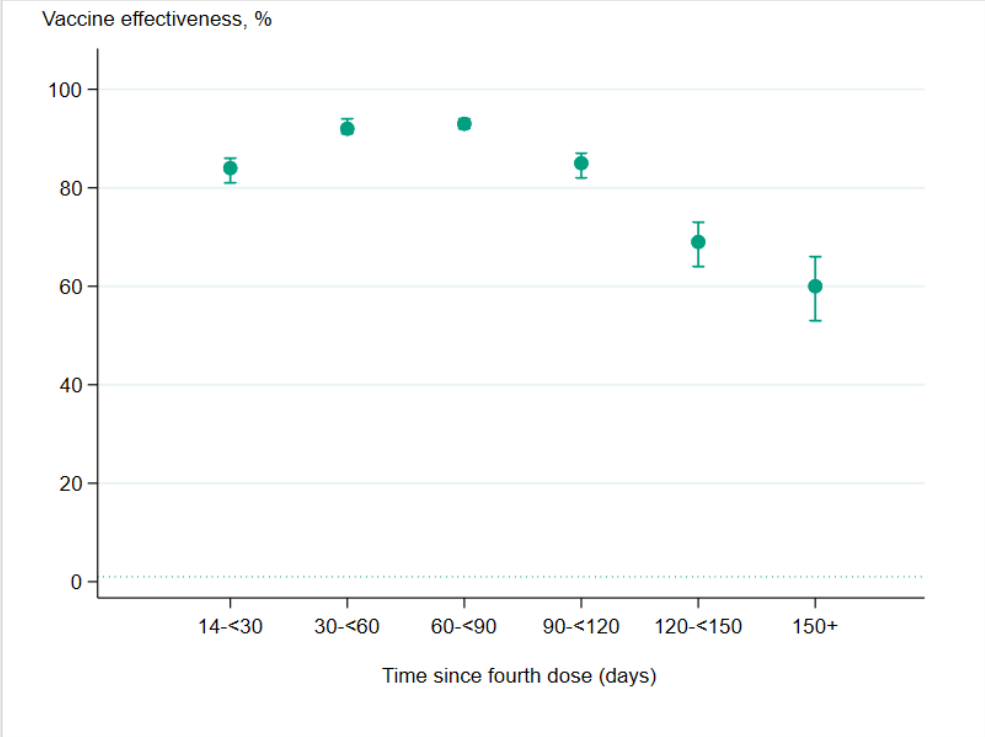

Table 1a. Number of observed COVID-19 infections and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	437	25,692	Reference	–
Four doses 14–<30 days	408	3,042	84% (95% CI: 81–86%)	<.0001
Four doses 30–<60 days	373	11,149	92% (95% CI: 91–94%)	<.0001
Four doses 60–<90 days	336	20,576	93% (95% CI: 92–94%)	<.0001
Four doses 90–<120 days	678	63,787	85% (95% CI: 82–87%)	<.0001
Four doses 120–<150 days	1,191	144,776	69% (95% CI: 64–73%)	<.0001
Four doses 150+ days	596	87,146	60% (95% CI: 53–66%)	<.0001

Figure 1b. Vaccine effectiveness against hospitalisation after the fourth dose among individuals 65 years of age and older living in care homes

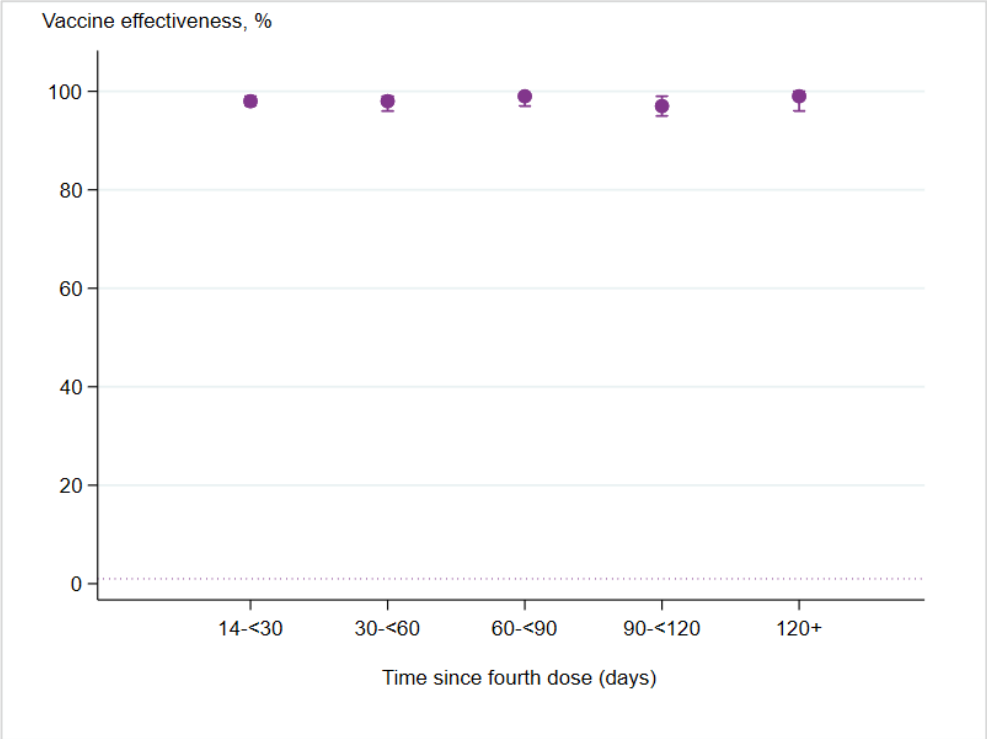

Table 1b. Number of hospitalised cases and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	50	1,076	Reference	–
Four doses 14–<30 days	x	x	98% (95% CI: 97–99%)	<.0001
Four doses 30–<60 days	14	399	98% (95% CI: 96–99%)	<.0001
Four doses 60–<90 days	8	500	99% (95% CI: 97–99%)	<.0001
Four doses 90–<120 days	16	1,406	97% (95% CI: 95–99%)	<.0001
Four doses 120+ days	x	x	99% (95% CI: 96–100%)	<.0001

x) Numbers <4 have been suppressed for confidentiality

Figure 1c. Vaccine effectiveness against mortality within 30 days after confirmed COVID-19 after the fourth dose among individuals 65 years of age and older living in care homes

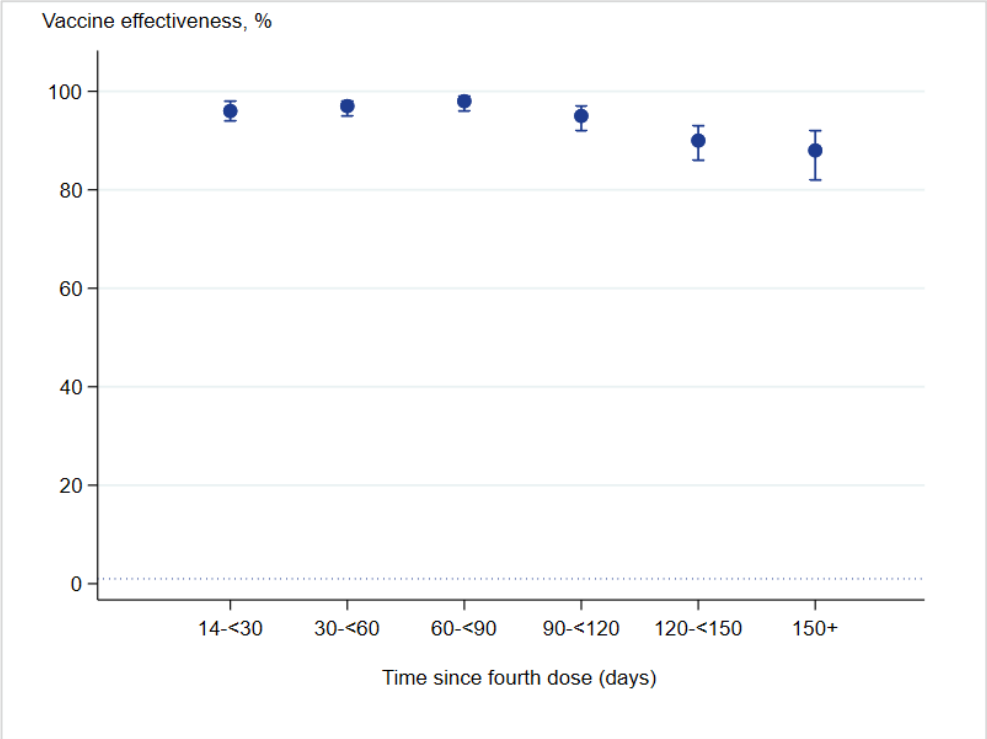

Table 1c. Number of deaths within 30 days after confirmed COVID-19 and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	78	4,046	Reference	–
Four doses 14–<30 days	22	165	96% (95% CI: 94–98%)	<.0001
Four doses 30–<60 days	32	916	97% (95% CI: 95–98%)	<.0001
Four doses 60–<90 days	22	1,415	98% (95% CI: 96–99%)	<.0001
Four doses 90–<120 days	47	4,410	95% (95% CI: 92–97%)	<.0001
Four doses 120–<150 days	78	9,447	90% (95% CI: 86–93%)	<.0001
Four doses 150+ days	40	5,834	88% (95% CI: 82–92%)	<.0001

Individuals aged 65 years and older receiving home help services

Figure 2a. Vaccine effectiveness against COVID-19 infection after the fourth dose among individuals 65 years of age and older receiving home help services

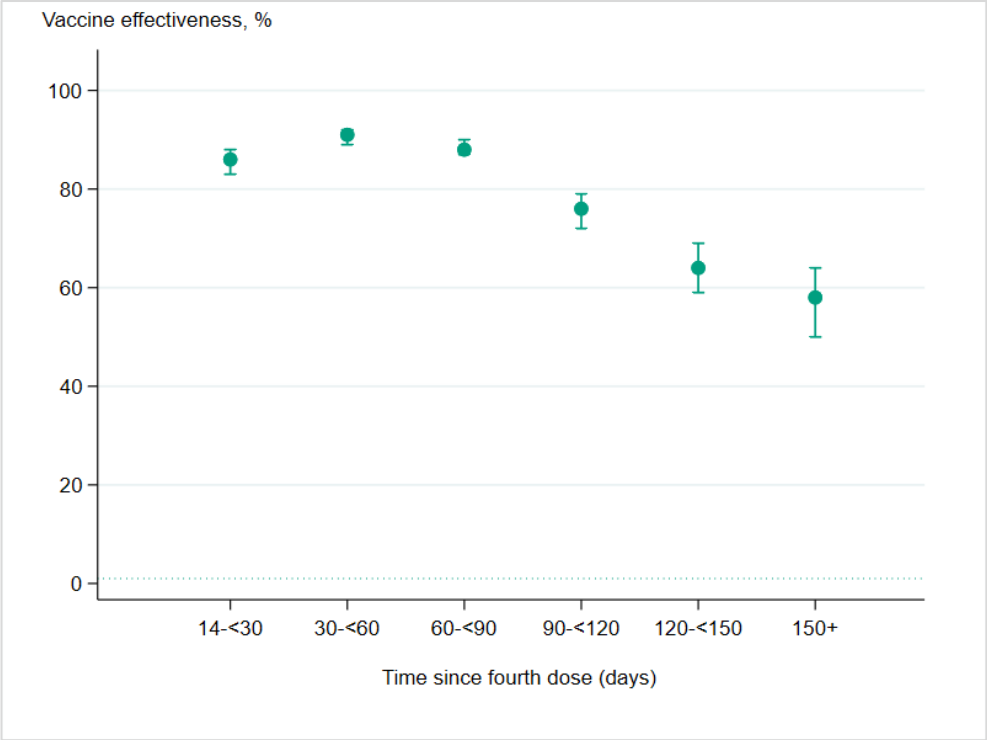

Table 2a. Number of observed COVID-19 infections and adjusted vaccine effectiveness with 95% confidence intervals

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	688	48,575	Reference	–
Four doses 14–<30 days	247	1,988	86% (95% CI: 83–88%)	<.0001
Four doses 30–<60 days	317	9,699	91% (95% CI: 89–92%)	<.0001
Four doses 60–<90 days	394	24,869	88% (95% CI: 87–90%)	<.0001
Four doses 90–<120 days	749	69,650	76% (95% CI: 72–79%)	<.0001
Four doses 120–<150 days	784	94,364	64% (95% CI: 59–69%)	<.0001
Four doses 150+ days	255	37,168	58% (95% CI: 50–64%)	<.0001

Figure 2b. Vaccine effectiveness against hospitalisation after the fourth dose among individuals 65 years of age and older receiving home help services

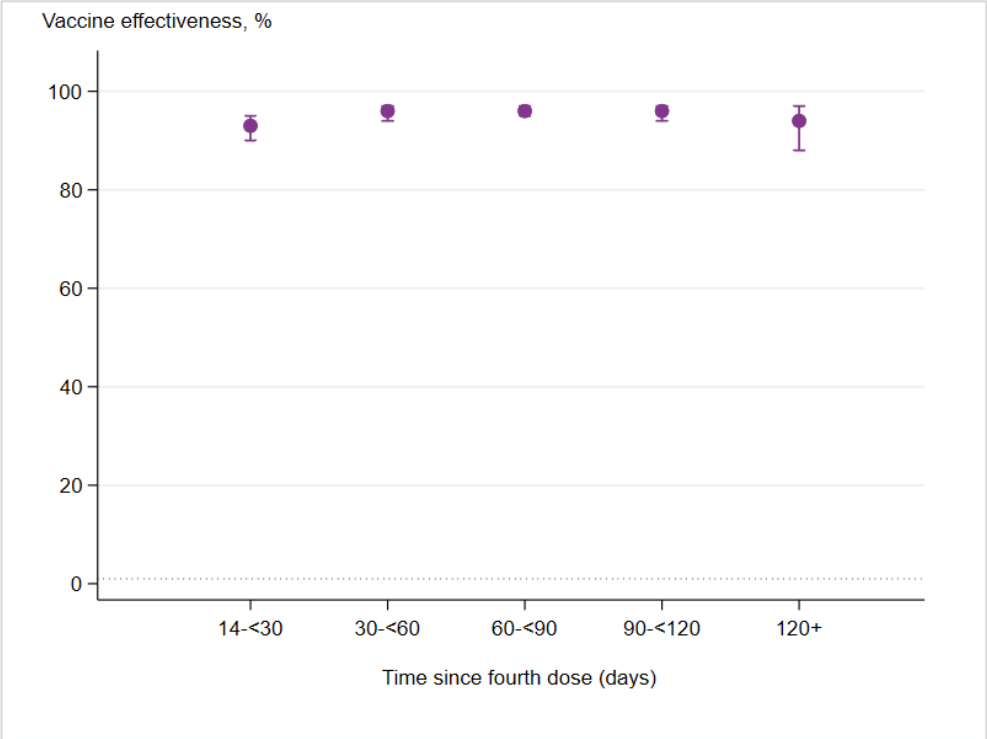

Table 2b. Number of hospitalised cases and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	192	7,672	Reference	–
Four doses 14–<30 days	40	357	93% (95% CI: 90–95%)	<.0001
Four doses 30–<60 days	44	1,413	96% (95% CI: 94–97%)	<.0001
Four doses 60–<90 days	39	2,435	96% (95% CI: 95–97%)	<.0001
Four doses 90–<120 days	34	3,030	96% (95% CI: 94–97%)	<.0001
Four doses 120+ days	12	1,356	94% (95% CI: 88–97%)	<.0001

Figure 2c. Vaccine effectiveness against intensive care and/or mortality within 30 days after confirmed COVID-19 after the fourth dose among individuals 65 years of age and older receiving home help services

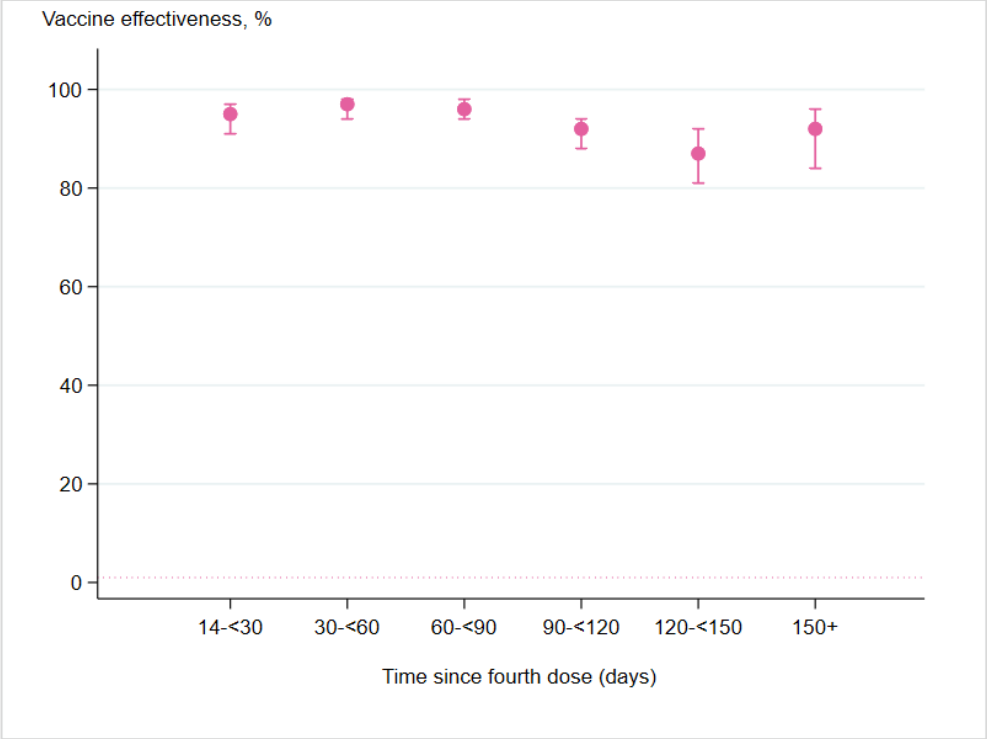

Table 2c. Number of cases of intensive care and/or deaths within 30 days after confirmed COVID-19 and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	114	7,959	Reference	–
Four doses 14–<30 days	17	159	95% (95% CI: 91–97%)	<.0001
Four doses 30–<60 days	23	763	97% (95% CI: 94–98%)	<.0001
Four doses 60–<90 days	24	1,470	96% (95% CI: 94–98%)	<.0001
Four doses 90–<120 days	50	4,660	92% (95% CI: 88–94%)	<.0001
Four doses 120–<150 days	55	6,639	87% (95% CI: 81–92%)	<.0001
Four doses 150+ days	10	1,434	92% (95% CI: 84–96%)	<.0001

Individuals aged 80 years and older not living in care homes or receive home help services

Figure 3a. Vaccine effectiveness against hospitalisation after the fourth dose among individuals 80 years of age and older not living in care homes or receive home help services

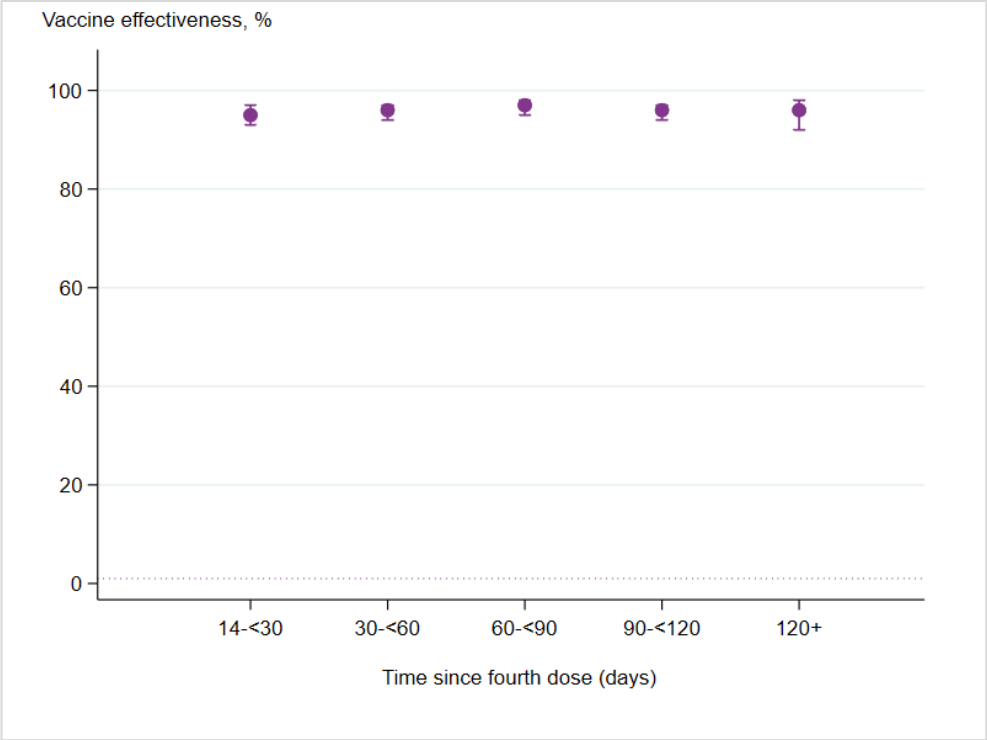

Table 3a. Number of hospitalised cases and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	134	5,252	Reference	–
Four doses 14–<30 days	35	295	95% (95% CI: 93–97%)	<.0001
Four doses 30–<60 days	55	1,700	96% (95% CI: 94–97%)	<.0001
Four doses 60–<90 days	45	2,782	97% (95% CI: 95–98%)	<.0001
Four doses 90–<120 days	48	4,295	96% (95% CI: 94–97%)	<.0001
Four doses 120+ days	11	1,251	96% (95% CI: 92–98%)	<.0001

Figure 3b. Vaccine effectiveness against intensive care and/or mortality within 30 days after confirmed COVID-19 after the fourth dose among individuals 80 years of age and older not living in care homes or receive home help services

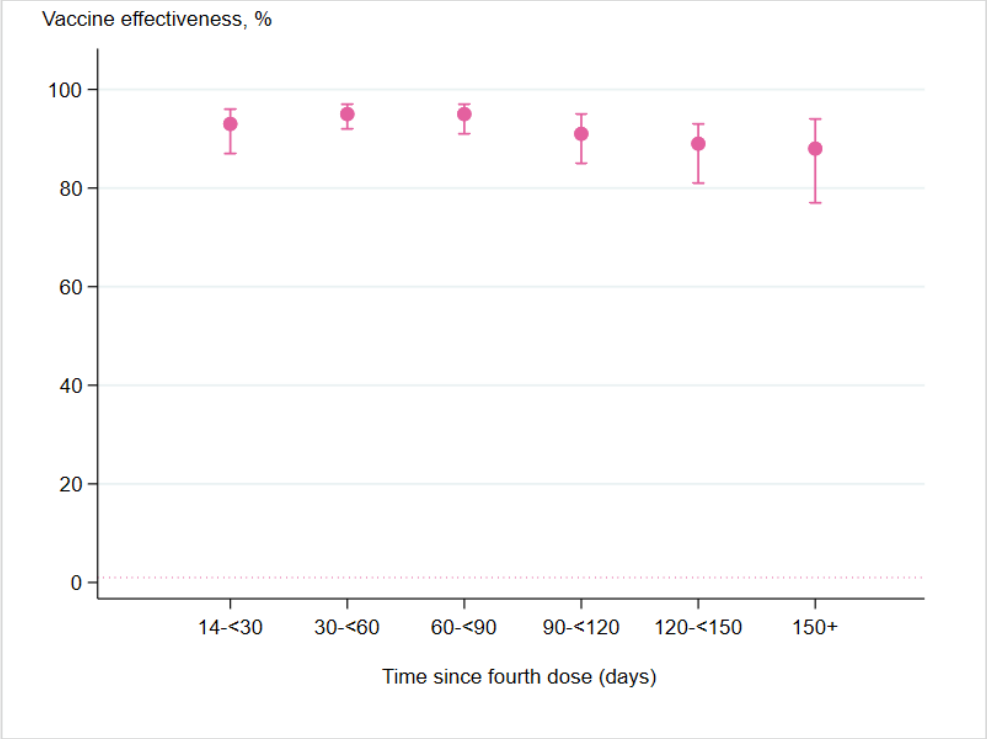

Table 3b. Number of cases of intensive care and/or deaths within 30 days after confirmed COVID-19 and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	55	4,255	Reference	–
Four doses 14–<30 days	16	141	93% (95% CI: 87–96%)	<.0001
Four doses 30–<60 days	21	644	95% (95% CI: 92–97%)	<.0001
Four doses 60–<90 days	24	1,498	95% (95% CI: 91–97%)	<.0001
Four doses 90–<120 days	38	3,507	91% (95% CI: 85–95%)	<.0001
Four doses 120–<150 days	38	4,587	89% (95% CI: 81–93%)	<.0001
Four doses 150+ days	12	1,774	88% (95% CI: 77–94%)	<.0001

Individuals aged 65–79 years not living in care homes or receive home help services

Figure 4a. Vaccine effectiveness against hospitalisation after the third and fourth dose among persons 65–79 years of age not living in care homes or receive home help services

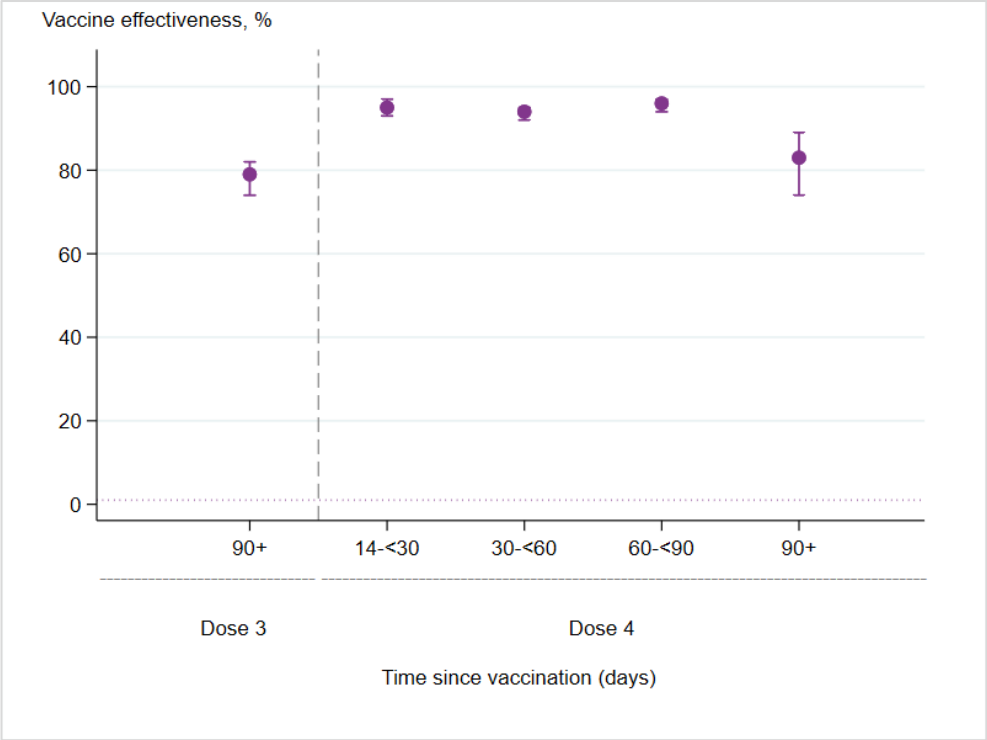

Table 4a. Number of hospitalised cases and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	185	6,922	Reference	–
Three doses 90+ days	467	16,542	79% (95% CI: 74–82%)	<.0001
Four doses 14–<30 days	27	1,214	95% (95% CI: 93–97%)	<.0001
Four doses 30–<60 days	65	5,109	94% (95% CI: 92–95%)	<.0001
Four doses 60–<90 days	33	3,243	96% (95% CI: 94–97%)	<.0001
Four doses 90+ days	23	2,904	83% (95% CI: 74–89%)	<.0001

Figure 4b. Vaccine effectiveness against intensive care and/or mortality within 30 days after confirmed COVID-19 after the third and fourth dose among persons 65–79 years of age not living in care homes or receive home help services

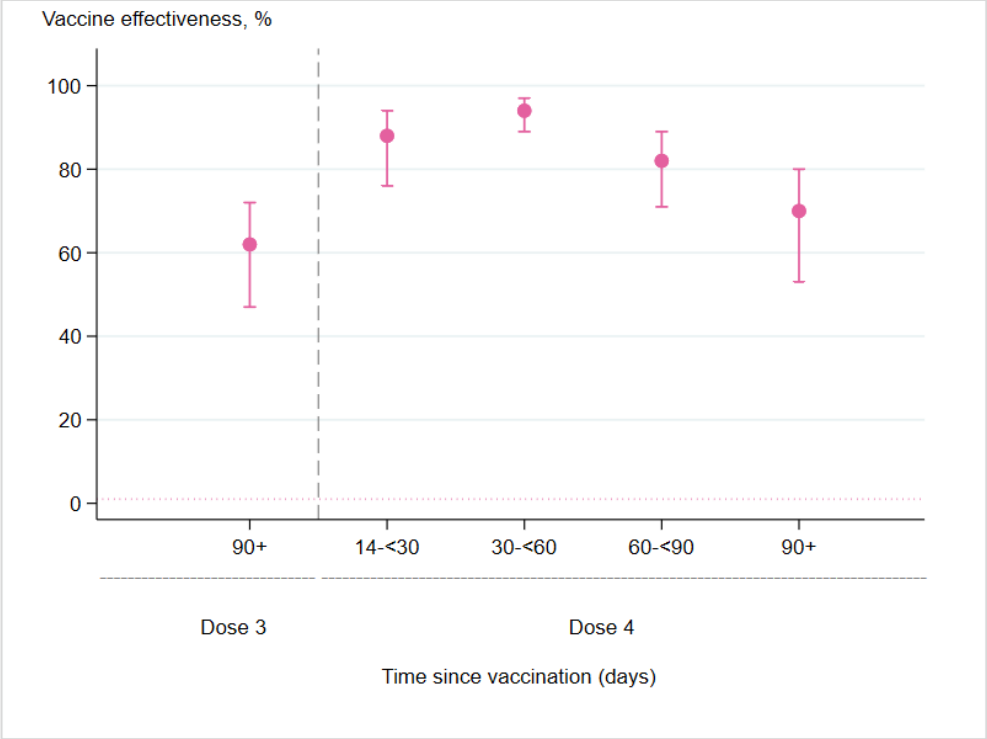

Table 4b. Number of cases of intensive care and/or deaths within 30 days after confirmed COVID-19 and adjusted vaccine effectiveness with 95% confidence interval

Category	Number	Person days	Vaccine effectiveness	p-value
Unvaccinated	64	4,671	Reference	–
Three doses 90+ days	211	11,129	62% (95% CI: 47–72%)	<.0001
Four doses 14–<30 days	12	830	88% (95% CI: 76–94%)	<.0001
Four doses 30–<60 days	11	990	94% (95% CI: 89–97%)	<.0001
Four doses 60–<90 days	32	4,054	82% (95% CI: 71–89%)	<.0001
Four doses 90+ days	46	6,961	70% (95% CI: 53–80%)	<.0001

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The Public Health Agency of Sweden is an expert authority with responsibility for public health issues at a national level. The Agency develops and supports activities to promote health, prevent illness and improve preparedness for health threats. Our vision statement: a public health that strengthens the positive development of society.

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