

1 **Supplemental Material for: Interrupting vaccination policies can**
2 **greatly spread SARS-CoV-2 and enhance mortality from**
3 **COVID-19 disease: the AstraZeneca case for France and Italy**

4 Davide Faranda*

5 *Laboratoire des Sciences du Climat et de l'Environnement,*
6 *CEA Saclay l'Orme des Merisiers, UMR 8212 CEA-CNRS-UVSQ,*

7 *Université Paris-Saclay & IPSL, 91191, Gif-sur-Yvette, France*

8 *London Mathematical Laboratory, 8 Margravine Gardens, London, W6 8RH, UK and*

9 *LMD/IPSL, Ecole Normale Supérieure,*

10 *PSL research University, 75005, Paris, France*

11 Tommaso Alberti

12 *National Institute for Astrophysics-Institute for*

13 *Space Astrophysics and Planetology (INAF-IAPS),*

14 *via del Fosso del Cavaliere 100, 00133, Rome, Italy*

15 Maxence Arutkin

16 *UMR CNRS 7083 Gulliver, ESPCI Paris,*

17 *10 rue Vauquelin, 75005 Paris, France*

18 Valerio Lembo

19 *Institute of Atmospheric Sciences and Climate (ISAC-CNR), Bologna, Italy*

20 Valerio Lucarini

21 *Department of Mathematics and Statistics,*

22 *University of Reading, Reading, UK and*

23 *Centre for the Mathematics of Planet Earth,*

24 *University of Reading, Reading, UK*

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Abstract

26

27 The supplemental Material for "Interrupting vaccination policies can greatly spread SARS-CoV-
28 2 and enhance mortality from COVID-19 disease: the AstraZeneca case for France and Italy"
29 contains: i) the numerical code used in this study, ii) 2 supplementary figures.

30 I. NUMERICAL CODE

31 %Numerical SEIR code for "Interrupting vaccination policies can greatly spread
32 %SARS-CoV-2 and enhance mortality from COVID-19 disease: the AstraZeneca case
33 %for France and Italy" by Faranda et al.
34 %This code integrates the SEIR Model with vaccination policies interrupted for 7 days.
35 %The data are referred to the Italian population

36

37 Country='Italy';

38 %Population;

39 N=60000000;

40

41 %Initial conditions

42 S(1)=N-9000000-2000000; %Susceptibles, including those

43 %who had the virus in the first and second wave (9 millions)

44 %and those who received two doses vaccines

45 E(1)=20000; %Exposed

46 I(1)=20000; %Infected

47 R(1)=11000000; %Recovered

48

49 %Parameters

50 alpha0=100000./N ; %Vaccination rate

51 sigma0=0.59 ; % Vaccine Efficacy

52 epsilon0=0.27 ; %Incubation Rate

53 beta0=0.37; %Recovery Rate

* davide.faranda@cea.fr

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54 lambda0=0.45 %Infection Rate
55 mort0=0.015; %Mortality
56 R0=lambda0./beta0; %Basic Reproduction number
57
58 %Dynamical steps
59 t_susp=7; %example where the vaccination is suspended for one week
60 Tint=500;
61
62 for t=1:Tint
63 %F
64 if t<t_susp
65 alpha=0;
66 sigma=0;
67 epsilon=epsilon0 +0.2*epsilon0*randn;
68 beta=beta0+0.2*beta0*randn;
69 lambda=lambda0+0.2*lambda0*randn;
70 else
71 alpha=alpha0+0.25*alpha0*randn;
72 sigma=sigma0+0.1*sigma0*randn;
73 epsilon=epsilon0 +0.2*epsilon0*randn;
74 beta=beta0+0.2*beta0*randn;
75 lambda=lambda0+0.2*lambda0*randn;
76 end
77
78 K(t)=I(t)*S(t)./N;
79 S(t+1)=S(t)-lambda*(1-alpha)*K(t)-(1-sigma)*alpha*lambda*K(t)-sigma*alpha*S(t);
80 E(t+1)=E(t)+lambda*(1-alpha)*K(t)+(1-sigma)*alpha*lambda*K(t)-epsilon*E(t);
81 I(t+1)=I(t)+epsilon*E(t)-(alpha+beta)*I(t);
82 R(t+1)=R(t)+sigma*alpha*S(t)+beta*I(t);
83 M(t+1)=0.015*I(t);
84
85 end

```

86 II. SUPPLEMENTARY FIGURES

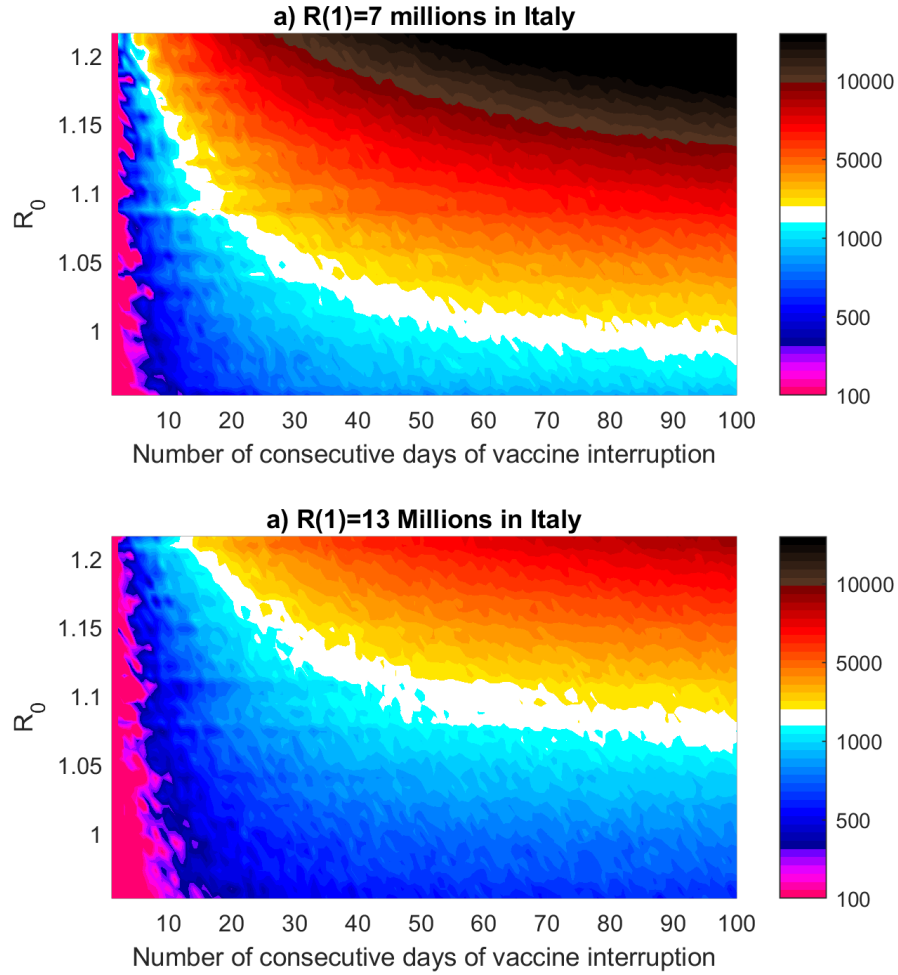


FIG. 1. Average over $N_r = 1000$ realizations of the SEIR model showing the excess deaths $m \times I(t)$ as a function of the number of the days of interruption of AstraZeneca vaccinations (x-axis) and R_0 (y-axis) for Italy with $R(1) = 7$ millions (a) and $R(1) = 13$ millions (b). The excess deaths are computed with respect to a base scenario where vaccine injections are never interrupted. Arrows indicate the values of R_0 chosen for Figs. 2 and 3. The model is integrated for 500 days.

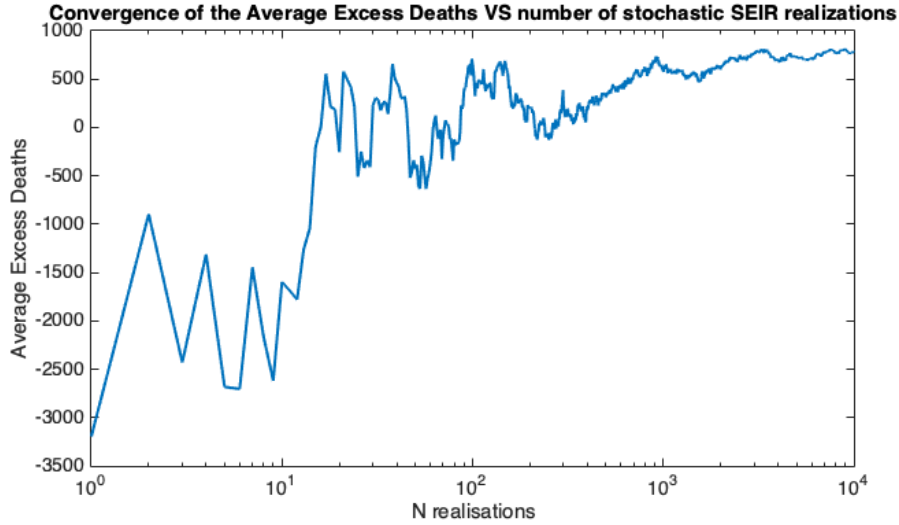


FIG. 2. Convergence in number of realisation N_r (x-axis) of the average excess deaths (y-axis) in Italy after a 5 days interruption of AstraZeneca vaccinations. The excess deaths are computed with respect to a base scenario where vaccine injections are never interrupted. The average excess death achieve a good convergence at 10^3 realizations.

87 III. ACKNOWLEDGEMENTS

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