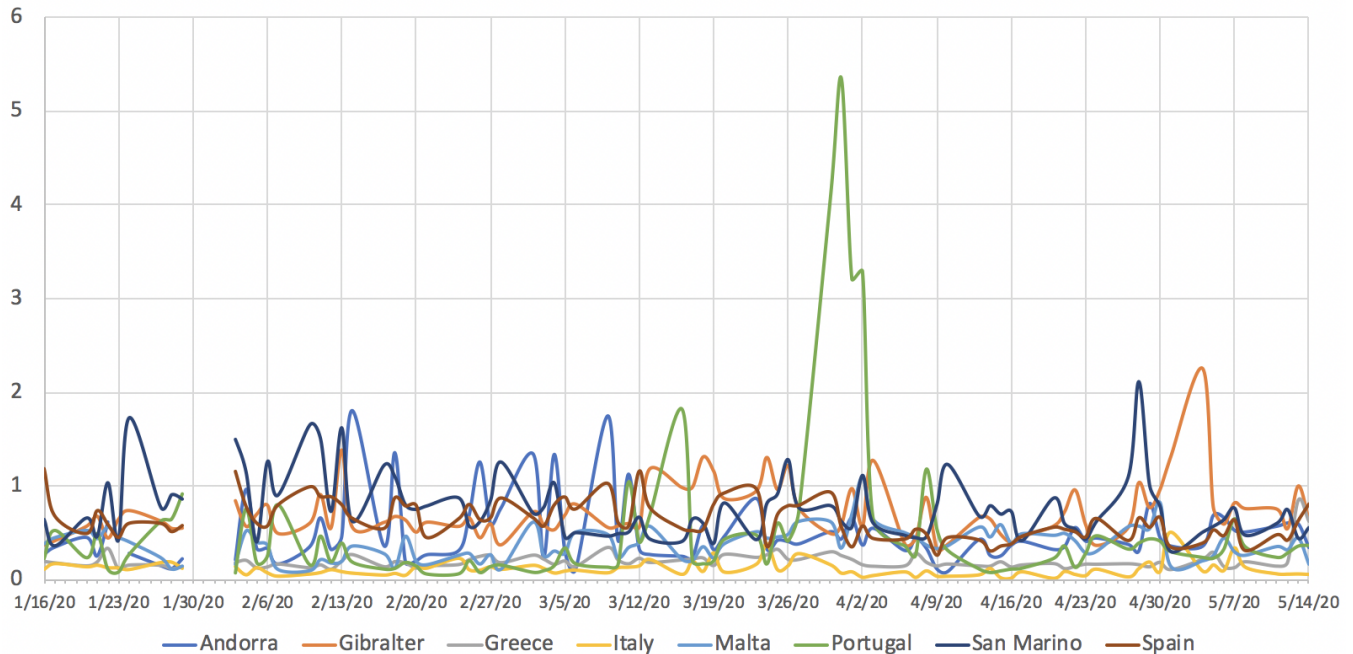# Pinger and Covid-19 for Southern Europe

Portugal

For Portugal there are two small spikes around 3/11-3/12 and 3/16 and then a big spike in IPDV between 3/28/20 and 4/1/20. On Mar 12 Portugal declared the highest level of alert following community transmission and on Mar 13th the total number cases exceeded 100. On Mar 31st the first death was announced. Also for Portugal see https://www.politico.eu/article/how-portugal-became-europes-coronavirus-exception/#%20European%20response%20to%20deaths


Southern Europe ping IPDV seen from SLAC

However when one looks at alldays instead of just weekdays the peak at 3/13/2020 does not look as prominent.Thus we are left with just the peak at the end of March and the start of April:

PingER and Covid19 in Southern Europe (no Portugal) IPDV alldays
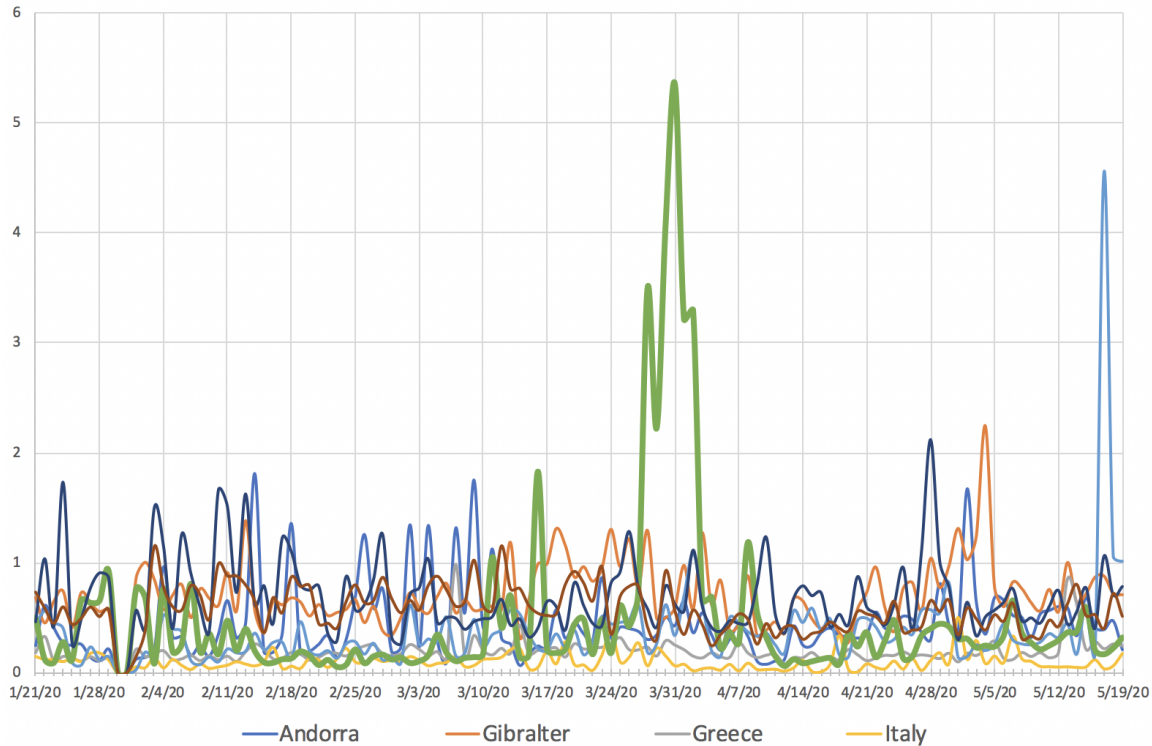
If one removes Portugal then there does not appear to be any significant increase or decrease in the IPDVs for the remaining countries around the times of the Covid-19 interventions in March.


Southern Europe without Portugal ping IPDV seen from SLAC
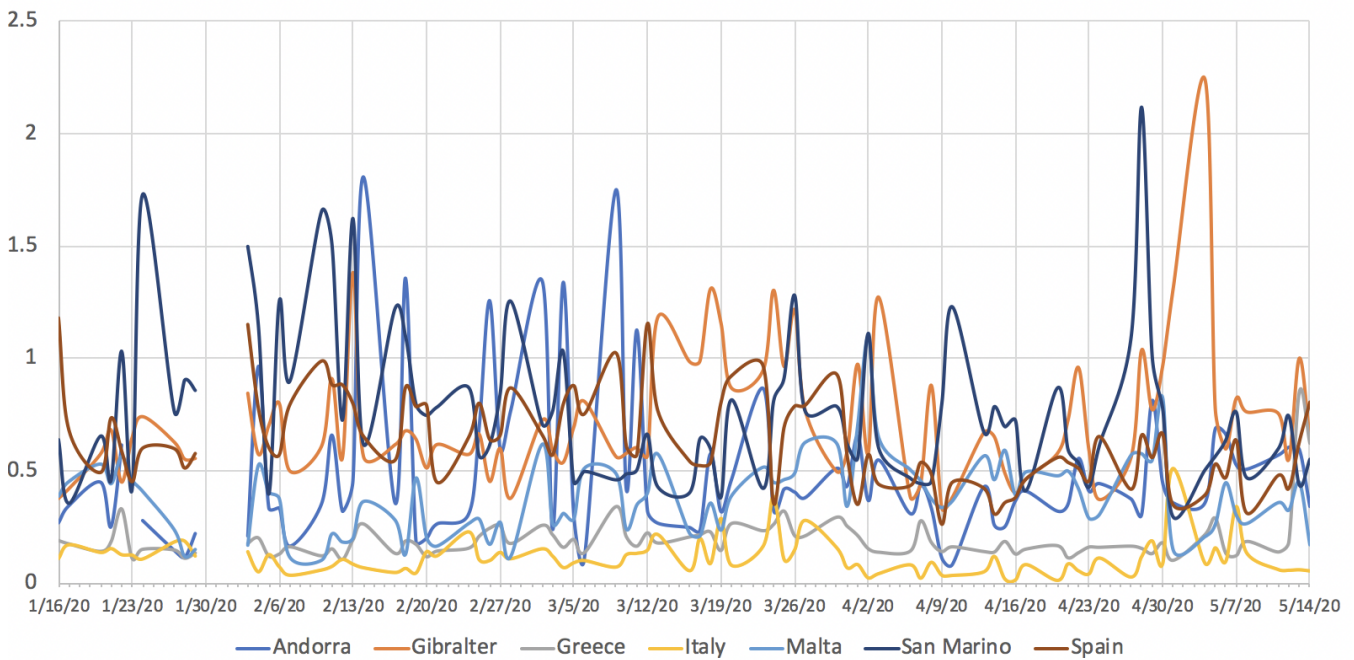
Spain & Italy

For the two most impacted countries, Spain and Italy, there is no dramatic change in the IPDV alldays data during the observed time frame, see the chart below for alldays where we have highlighted Spain and Italy:

PingER and Covid19 in Southern Europe IPDV alldays

Legend: Andorra, Gibralter, Greece, Italy, Malta, Portugal, San Marino, Spain
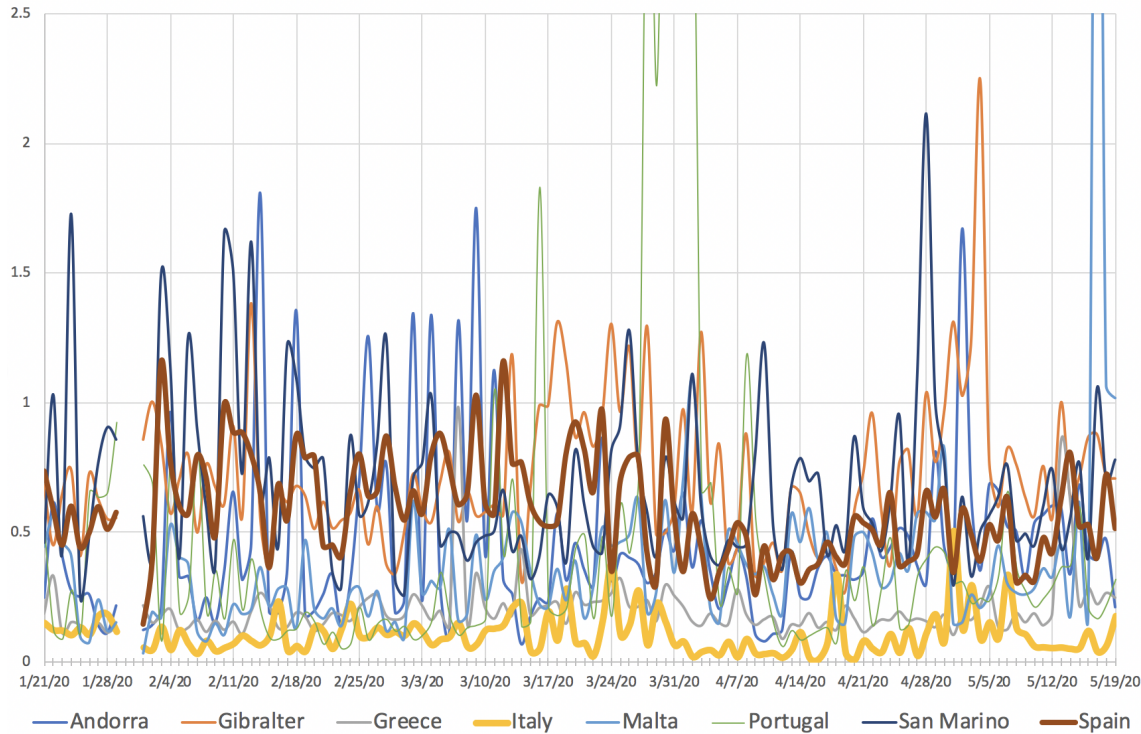
Spain

Spain's 1st case was on Jan 31st. On Mar 14th a national lockdown was imposed Mar 14. On Mar 30th all non-essential workers were ordered to remain at home. Looking at the chart for Spain above there is evidence of drop off in IPDV when one compares March and April 2020. Taking the means and percentiles plus the averages and standard deviations for March and April we get:

	Mar	Apr
ES median	0.426	0.659
ES 25%	0.3735	0.568
ES 75%	0.52925	0.8005

	Mar	Apr
ES Average	0.70	0.44
ES Stdev	0.23	0.14

Also if one takes a window of 31 days and in that window calculate the average IPDV for those 31 days then starting the window on Jan 20th, 2020 and sliding it forward one day at a time until the window's last day is May 17th, 2020, one gets the chart below. In this chart it is seen that the 31-da, window average IPDV drops from about 0.7msec (window starts 29-Feb) to about 0.45msec (window starts April 2nd), This represents a drop of about 50% centered around the time of the interventions in Spain. There is an Excel spread sheet for this data.

Avg IPDV

PingER monitors 4 hosts in Spain. Two https://www.slac.stanford.edu and http://www.uam.es are connected to SLAC via the high-performance research networks ESnet, GARR and REDIRIS. A third, speedtest.servihosting.es, is a network speed testing host. The fourth, www.ipv6tf.org is an IPV6 host.

Italy

For Italy the main effect that may be associated with Covid-19 interventions appears to be an increase in the variability of the IPDV. See the chart below where we take a window of 31 days and in that window calculate the average IPDV for those 31 days. We start the window on Jan 23rd, 2020 and slide it forward one day at a time, until the window's last day is May 20th, 2020. One gets the chart below. In the chart, against the date of each window's start (bottom x axis) we show the average IPDV for the window, the IPDV of the first date in the window, the minimum and maximum IPDVs in the window, the standard deviation, and. the standard deviation/average. Against the top x-axis we show the IPDV of the last data point in the window.

Italy IPDV
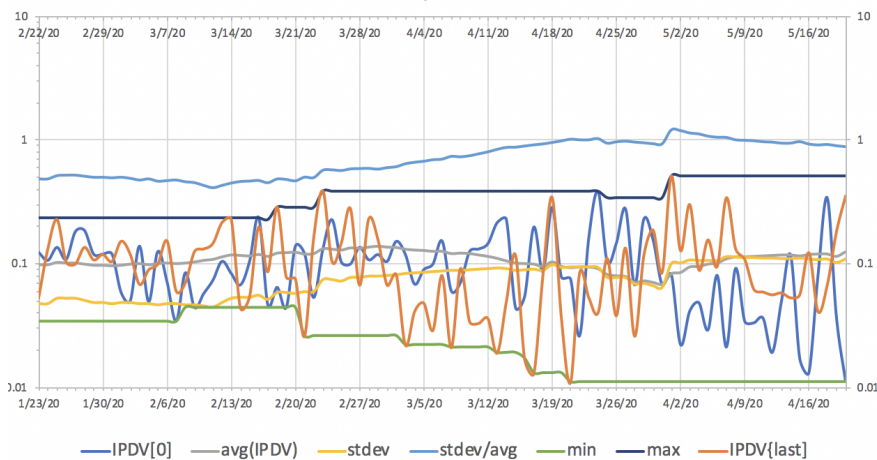
According to https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Italy#Nationwide_measures, the 1st cases were on Jan 31st, the first death was Feb 22, by Mar 4 there were 100 deaths. On Mar 1st parts of Italy were put into quarantine, sports events were suspended, schools, theatres, clubs and cinemas were closed. This was extended to all Italy Mar 4th. On Mar 7 and 8 parts of Ital=y were placed in lockdown and gyms, swimming pools, spas wellness centres, shopping centres were closed over. the weekend. May 9 the lockdown was extended to all of Italy. There were further restrictions Mar 21 and 24.

Note that there are 6 Italian hosts monitored. Five are part of INFN and are connected by high-speed networks including ESnet, GEANT, and GARR. The other is speed.unidata.it, a Speedtest host (http://speed.unidata.it/speedtest/upload.php). Thus the hosts are not very representative of connections to public hosts.