Summary of MIDAS Modeling Studies

Home Stockpiling of Antivirals
Presented June 17, 2008

The following is a MIDAS consensus statement of results and analyses presented by MIDAS modelers at a June 17, 2008 Department of Health and Human Services meeting on the implications of home stockpiling of antivirals.

At the uptake and correct usage levels proposed, AV Medkits located in homes are predicted to reduce expected pandemic influenza illness attack rates by less than 2% for any scenario examined (i.e. for an assumed mitigated attack rate in the absence of Medkits of 21%, attack rates might be reduced to 20%). Addition of a comparable quantity of antivirals to a public stockpile shows considerably greater effects. AV Medkits might cause moderate reductions demand for the public stockpile should attack rates be more severe than the planning assumptions for a mitigated pandemic (15%-22%), but only if public stocks could be moved between States to compensate for variation in Medkit uptake across the country. Effects on mortality and severe disease were not assessed, but since modeling showed that private stockpiles only increases the proportion of cases treated by 1%-2% for the assumed mitigated attack rates, any clinical benefit of AV medkits will largely be due to treatment being started more rapidly.

MIDAS analyses demonstrated that home stockpiling of antivirals, regardless of the mechanism, results in significant wastage of antivirals (e.g., most of those who have it won't need it, under assumed attack rates ~15-22%, and most of those who need it won't have it, particularly under market-based distribution with uptake rates of 5-25%). Public stockpiling, by contrast, would direct antivirals to those who need them, though possibly in a less timely fashion than if they were already in private hands. This highlights the need to focus on mechanisms of distribution for public stockpiles. A concern regarding market-based solutions compared to even/random distribution is that variation in household income within and between States will generate spatially uneven Medkit uptake levels. Such spatial variation decreases the overall effectiveness of a stockpile in reducing attack rates (unless the public stockpile can be redistributed to compensate), though this is less of an effect than wastage caused by preallocation.

The evolution and spread of resistant strains is subject to many large uncertainties (e.g., mutation rate, fitness of a resistant virus, where and when a resistant strain emerges, etc). It is likely that, during a pandemic, a transmissible, resistant strain will emerge and spread to some extent, and any policy (including home MedKits) which increases antiviral use is likely to

exacerbate this spread. A more relevant measure of a policy's public health impact is the modeled illness attack rate, and there are plausible scenarios in which home MedKits would (a) increase modestly, (b) decrease modestly, or (c) leave essentially unchanged the final attack rate. Reliable estimates the relative probabilities of these scenarios are not possible at this time. Using the public stockpile for treatment increases the probability of resistance developing, but the impact depends on how quickly mass treatment is started relative to the start of the US epidemic, how quickly individuals are treated, and whether prophylaxis is used.

Clustered or uneven uptake of antivirals (a possible outcome of market-based distribution) decreases the overall efficacy of antivirals in reducing attack rate. A macroeconomic analysis examined the economic efficiency of broad public distribution of antivirals in a pandemic for prophylactic use under a range of assumptions about pandemic severity and duration of antiviral use, and concluded benefits exceeded costs for most of the scenarios examined. However, the many uncertainties surrounding the risk of a severe pandemic, the magnitude of economic impact, the practicality of delivery of large scale prophylaxis, and the occurrence of resistance mean than conclusions about absolute cost-benefit cannot be definitive. But these uncertainties do not affect the key conclusions than public stockpiling has substantially greater cost effectiveness than the equivalent level of private stockpiling.

In conclusion, all the MIDAS analyses agreed that the main reason for the limited impact of AV Medkits on attack rates is wastage caused by misallocation – MedKits are assigned without regard to need, and in planning scenarios assuming 15%-22% attack rates, most households/persons will not need MedKits. Any solution which increases coverage of home stockpiling (e.g. public or private insurance coverage) may improve equity of distribution, but will not address this key efficiency concern. Additionally, the cost-benefit of insurance coverage may be substantially inferior to that of current uses of those funds. To minimize expected pandemic clinical attack rates and reduce severe disease and death, policies should provide widespread and timely coverage of antiviral medication without pre-allocating stocks to individuals or households and allowing antivirals to be redistributed according to need during the epidemic.