

```

23: for  $d = 1$  to  $D$  do
24:   draw  $\boldsymbol{\theta}^{(d)} \sim \text{Dir}(\alpha, \mathbf{m})$ 
25:   set  $\bar{N}^{(d)} = \max(1, N^{(d)})$ 
26:   for  $n = 1$  to  $\bar{N}^{(d)}$  do
27:     draw  $z_n^{(d)} \sim \boldsymbol{\theta}^{(d)}$ 
28:     if  $N^{(d)} \neq 0$  then
29:       draw  $w_n^{(d)} \sim \phi^{(z_n^{(d)})}$ 
30:     end if
31:   end for
32:   for  $c = 1$  to  $C$  do
33:     set  $\bar{N}^{(c|d)} = \sum_{n=1}^{\bar{N}^{(d)}} \delta(l_{z_n^{(d)}} = c)$ 
34:   end for
35:   for  $r = 1$  to  $A$  do
36:     draw  $y_r^{(d)} \sim \text{Bern}(\sum_{c=1}^C \frac{\bar{N}^{(c|d)}}{\bar{N}^{(d)}} p_{a^{(d)}r}^{(c)})$ 
37:   end for
38: end for
39: end for

```