1 Figure 1

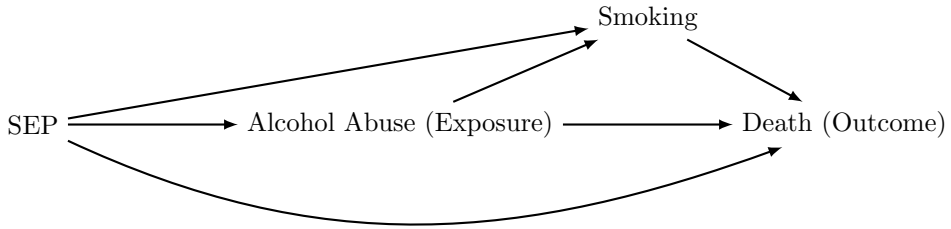


Figure 1: An example of a DAG with exposure to alcohol abuse, Outcome death, confounder socioeconomic position, and mediator smoking.

Code for figure:

```
\begin{tikzpicture}
    \node (1) {};
    \node [right =of 1] (2)  {Alcohol Abuse (Exposure)};
    \node [right =of 2] (3) {};
    \node [right =of 3] (4) {Death (Outcome)};
    \node [left =of 1] (5) {SEP};
    \node [above =of 3] (6) {Smoking};

    \draw[Arrow] (2.east)--(4.west);
    \draw[Arrow] (2) to (6);
    \draw[Arrow] (6) to (4);
    \draw[Arrow] (5) to [out=-25, in=-160] (4);
    \draw[Arrow] (5) to (6);
    \draw[Arrow] (5.east)--(2.west);
\end{tikzpicture}
```

2 Figure 2

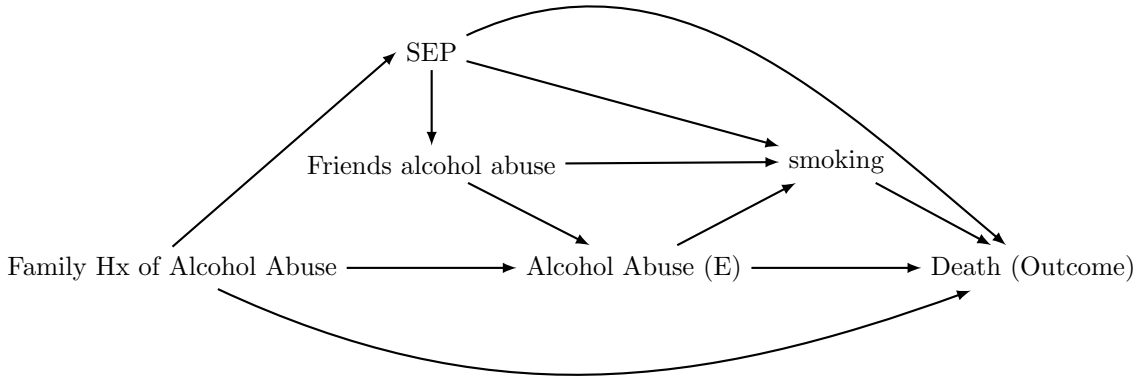


Figure 2: Family history of alcohol abuse, socioeconomic position, and friends' alcohol abuse are confounders; smoking is a mediator, alcohol abuse is the exposure of interest, and mortality is the outcome of interest.

Code for figure 2:

```
\begin{tikzpicture}
    \node (1) {Family Hx of Alcohol Abuse};
    \node [above =of 1] (11) {};
    \node [above =of 11] (12) {};
    \node [above =of 12] (13) {};
    \node [right =of 1] (2) {};
    \node [above =of 2] (10) {Friends alcohol abuse};
    \node [above =of 10] (8) {SEP};
    \node [right =of 2] (3) {Alcohol Abuse (E)};
    \node [above =of 3] (9) {};
    \node [right =of 8] (7) {};
    \node [right =of 3] (4) {};
```

```
    \node [above =of 4] (6) {smoking};
    \node [right =of 4] (5) {Death (Outcome)};
    \draw[Arrow] (3.east)--(5.west);
    \draw[Arrow] (3) to (6);
        \draw[Arrow] (6) to (5);
    \draw[Arrow] (1) to (3);
        \draw[Arrow, thick] (1.north)--(8.west);
        \draw[Arrow] (1) to [out=-25, in=-160] (5);
    \draw[Arrow] (8) to (6);
    \draw[Arrow] (8) to [out=25, in=140] (5);
    \draw[Arrow] (10) to (6);
    \draw[Arrow] (10) to (3);
    \draw[Arrow] (8) to (10);
\end{tikzpicture}
```

3 Figure 3

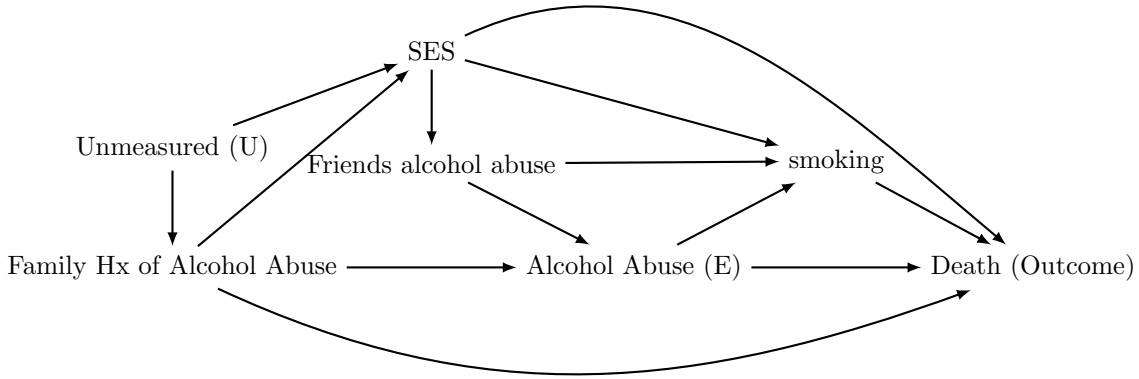


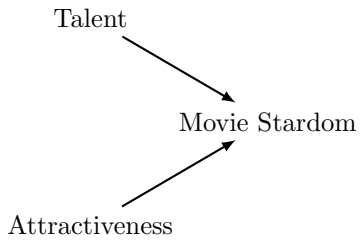
Figure 3: The DAG from Figure 2 with an unmeasured confounder. In this case, U is either unknown or unmeasured but is a common cause of a family history of alcohol abuse and smoking.

```
\begin{tikzpicture}
\node (1) {Family Hx of Alcohol Abuse};
\node [above =of 1] (11) {};
\node [above =of 11] (12) {};
\node [above =of 12] (13) {};
\node [right =of 1] (2) {};
\node [above =of 2] (10) {Friends alcohol abuse};
\node [above =of 10] (8) {SES};
\node [right =of 2] (3) {Alcohol Abuse (E)};
\node [above =of 3] (9) {};
\node [right =of 8] (7) {};
\node [right =of 3] (4) {};
\node [above =of 4] (6) {smoking};
```

```
    \node [right =of 4] (5) {Death (Outcome)};
    \node [above =of 1] (14) {Unmeasured (U)};
    \draw[Arrow] (3.east)--(5.west);
    \draw[Arrow] (3) to (6);
        \draw[Arrow] (6) to (5);
    \draw[Arrow] (1) to (3);
        \draw[Arrow, thick] (1) to (8);
        \draw[Arrow] (1) to [out=-25, in=-160] (5);
    \draw[Arrow] (8) to (6);
    \draw[Arrow] (8) to [out=25, in=140] (5);
    \draw[Arrow] (10) to (6);
    \draw[Arrow] (10) to (3);
    \draw[Arrow] (8) to (10);
    \draw[Arrow] (14) to (1);
    \draw[Arrow] (14) to (8);
\end{tikzpicture}
```

4 Figure 4

4.1 Figure 4a



4.2 Figure 4b

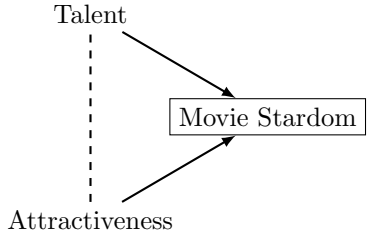


Figure 4: A) Movie stardom is a collider without adjustment, there is no relationship between a attractiveness and talent B) After adjustment for the collider, there is an induced relationship between talent and attractiveness (dashed line), which is not truly causal.

Code for figure 4a and 4b:

```
%Figure 4a
\begin{tikzpicture}
    \node (1) {Attractiveness};
    \node  [right =of 1] (2) {};
    \node [right =of 2] (3)  {};
    \node [above =of 2] (4) {Movie Stardom};
```

```
    \node [above =of 1] (6) {};
    \node [above =of 6] (7) {Talent};

    \draw[Arrow] (7) to (4);
    \draw[Arrow] (1) to (4);
\end{tikzpicture}

%Figure 4b
\begin{tikzpicture}
    \node (1) {Attractiveness};
    \node  [right =of 1] (2) {};
    \node [right =of 2] (3)  {};
    \node [rectangle, draw, above =of 2] (4) {Movie Stardom};
    \node [above =of 1] (6) {};
    \node [above =of 6] (7) {Talent};

    \draw[Arrow] (7) to (4);
    \draw[Arrow] (1) to (4);
    \draw[dashed, thick] (1) to [out=90, in=-90] (7);
\end{tikzpicture}
```

5 Figure 5

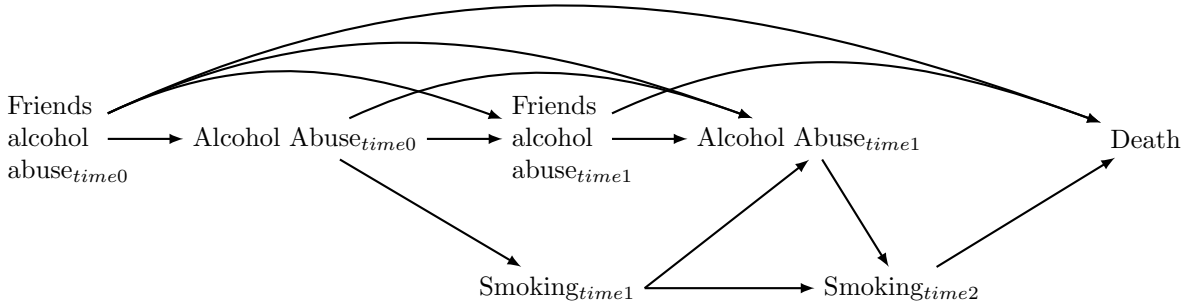


Figure 5: Time Variant DAG with the exposure to alcohol abuse was measured at baseline, and a later follow-up (Alcohol abuse$_{time1}$, and smoking and friends who abuse alcohol were also measured at baseline and follow-up. The outcome is unchanged and is 5-year mortality (Death).

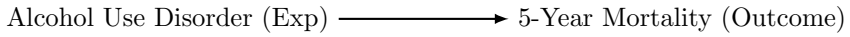
Code for figure 5:

```
\begin{tikzpicture}
\node (1) {Friends EtOH Abuse$Z_0$};
\node [right =of 1] (2) {Alchol Abuse$E_0$};
\node [right =of 2] (3) {Friends EtOH Abuse$Z_1$};
\node [right =of 3] (4) {Alchol Abuse$_1$};
\node [right =of 4] (5) {};
\node [right =of 5] (8) {D};
\node [below =of 3] (6) {Smoking$_0$};
\node [right =of 6] (9) {};
\node [right =of 9] (7) {$Smoking_1$};
\draw[Arrow, thick] (1.east) -- (2.west);
\draw[Arrow, thick] (1) to [out=25, in=160] (3);
\draw[Arrow, thick] (1) to [out=25, in=160] (4);
\draw[Arrow, thick] (1) to [out=25, in=160] (8);
\draw[Arrow, thick] (2.east) -- (3.west);
```

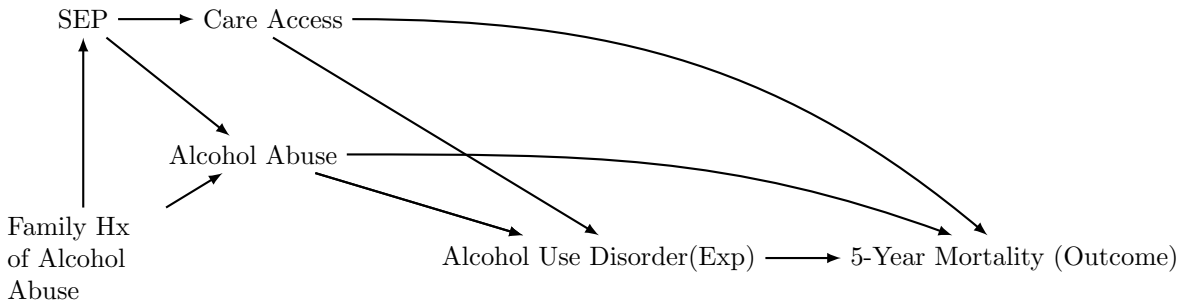
```
    \draw[Arrow, thick] (2) to [out=25, in=160] (4);
    \draw[Arrow, thick] (3.east) -- (4.west);
    \draw[Arrow, thick] (3) to [out=25, in=160] (8);
    \draw[Arrow, thick] (2) to (6);
    \draw[Arrow, thick] (6.east) -- (4.south);
    \draw[Arrow, thick] (6.east) -- (7);
    \draw[Arrow, thick] (4) to (7);
    \draw[Arrow, thick] (7) to (8);
\end{tikzpicture}
```

6 Figure 6

6.1 6a



6.2 6b



6.3 6c

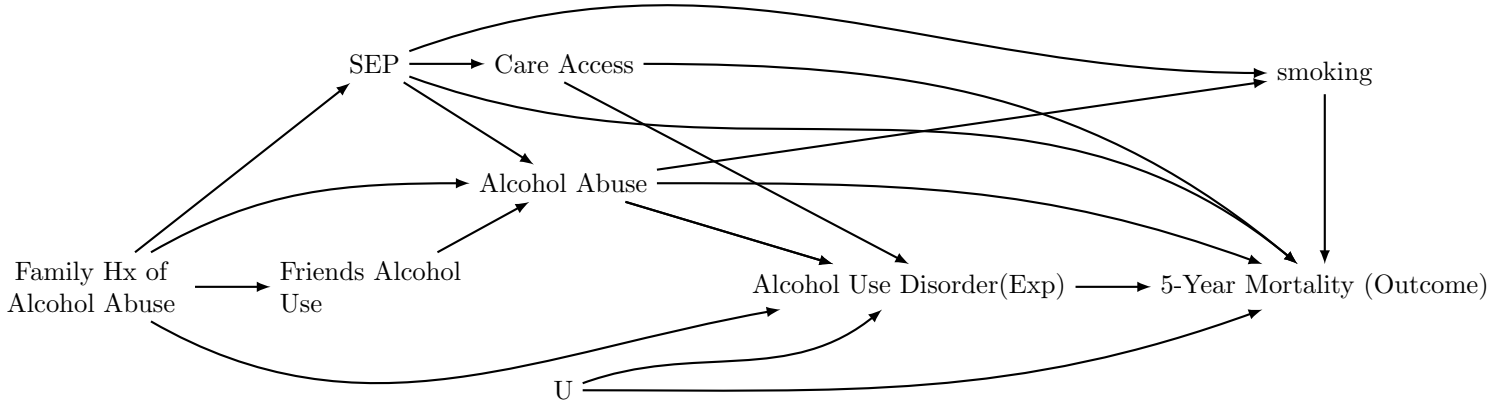


Figure 6: Process of constructing a DAG. A) The process starts with defining the exposure and outcome of interest. B) Initial DAGs can be constructed using expert knowledge and previous studies to inform variables that are related to both the exposure and outcome, but also other variables. C) Refinement and consensus help complete the DAG including all relationships between variables and the exposure and outcome. Exp=exposure, SEP=Socioeconomic Position, Hx=history, U=unmeasured and possibly unknown.

Code for figure 6a:

```
\begin{tikzpicture}
    \node (1) {};
    \node [right =of 1] (2) {};
    \node [right =of 2] (3) {Alcohol Use Disorder(Exp)};
    \node [right =of 3] (4) {};
    \node [right =of 4] (5) {5-Year Mortality (Outcome)};
    \draw[Arrow] (3.east)--(5.west);
\end{tikzpicture}
```

Code for figure 6b:

```
\begin{tikzpicture}
    \node (1) [text width=2cm] {Family Hx of Alcohol Abuse};
    \node [right =of 1] (2) {};
    \node [right =of 2] (3) {};
    \node [right =of 3] (4) {Alcohol Use Disorder(Exp)};
    \node [right =of 4] (6) {5-Year Mortality (Outcome)};
    \node [above =of 1] (13) {};
    \node [above =of 2] (9) {Alcohol Abuse};
    \node [above =of 13] (7) {SEP};
    \node [right =of 7] (8) {Care Access};
    \draw[Arrow] (4.east)--(6.west);
    \draw[Arrow] (1.north) to (7.south);
    \draw[Arrow] (7.east) to (8.west);
    \draw[Arrow] (7) to  (9);
    \draw[Arrow] (9) to  (4);
    \draw[Arrow] (8) to [out=0, in=140] (6);
    \draw[Arrow] (8.south) to  (4.north);
    \draw[Arrow] (9) to  (4);
    \draw[Arrow] (9) to [out=0, in=160]  (6);
    \draw[Arrow] (1) to (9);
\end{tikzpicture}
```

Code for figure 6c:

```
\begin{tikzpicture}
```

```
        \node (1) [text width=2.5cm] {Friends Alcohol Use};
        \node [right =of 1] (2) {};
        \node [right =of 2] (3) {};
        \node [right =of 3] (4) {Alcohol Use Disorder(Exp)};
        \node [right =of 4] (6) {5-Year Mortality (Outcome)};
        \node [above =of 1] (13) {};
        \node [above =of 2] (9) {Alcohol Abuse};
        \node [above =of 13] (7) {SEP};
        \node [right =of 7] (8) {Care Access};
        \node [above =of 6] (15) {};
        \node [above =of 15] (16) {smoking};
        \node [below =of 2] (17) {U};
        \node [left =of 1, text width=2.5cm,align=center] (18) {Family Hx of Alcohol Abuse};
        \draw[Arrow] (4.east)--(6.west);
        \draw[Arrow] (18.east) to (1.west);
        \draw[Arrow] (7.east) to (8.west);
        \draw[Arrow] (7) to  (9);
        \draw[Arrow] (9) to  (4);
        \draw[Arrow] (8) to [out=0, in=140] (6);
        \draw[Arrow] (8.south) to  (4.north);
        \draw[Arrow] (9) to  (4);
        \draw[Arrow] (9) to [out=0, in=160]  (6);
        \draw[Arrow] (1) to (9);
        \draw[Arrow] (7) to [out=20, in=180] (16);
        \draw[Arrow] (9) to (16);
        \draw[Arrow] (16) to (6);
        \draw[Arrow] (17) to [out=20, in=-140] (4);
        \draw[Arrow] (17) to [out=0, in=-160](6);
        \draw [Arrow] (7) to [out=-20, in=140] (6);
        \draw [Arrow] (18) to (7);
        \draw [Arrow] (18) to [out=30, in=180] (9);
        \draw [Arrow] (18) to [out=-30, in=-170] (4);
    \end{tikzpicture}
```