

Annexe X

Distributions des variables discriminantes – $H \rightarrow \tau\tau$

Cette annexe présente des distributions des variables discriminantes avant ajustement des paramètres de nuisance sur les événements utilisés dans l’analyse des événements $H \rightarrow \tau\tau$ présentée dans le chapitre 4. Cet ajustement dépend en effet de l’étude exacte menée (limites indépendantes du modèle, dépendantes d’un modèle, duquel, etc.). Les distributions avant ajustement sont en revanche communes aux différentes études menées au chapitre 4.

Pour chacune des trois années de prise de données (2016, 2017, 2018), chacun des quatre canaux ($\tau_h\tau_h$, $\mu\tau_h$, $e\tau_h$, $e\mu$) et chacune des catégories définies au chapitre 4, la distribution de la variable discriminante associée est donnée.

Dans chacun des graphiques, les données observées (points noirs) sont comparées à la modélisation des bruits de fond (histogrammes remplis en couleur et empilés). Les bandes grisées correspondent à l’incertitude totale (statistique et systématique) sur le bruit de fond avant ajustement des paramètres de nuisance par COMBINE. Le rapport au bruit de fond est donné dans la partie inférieure des graphiques.

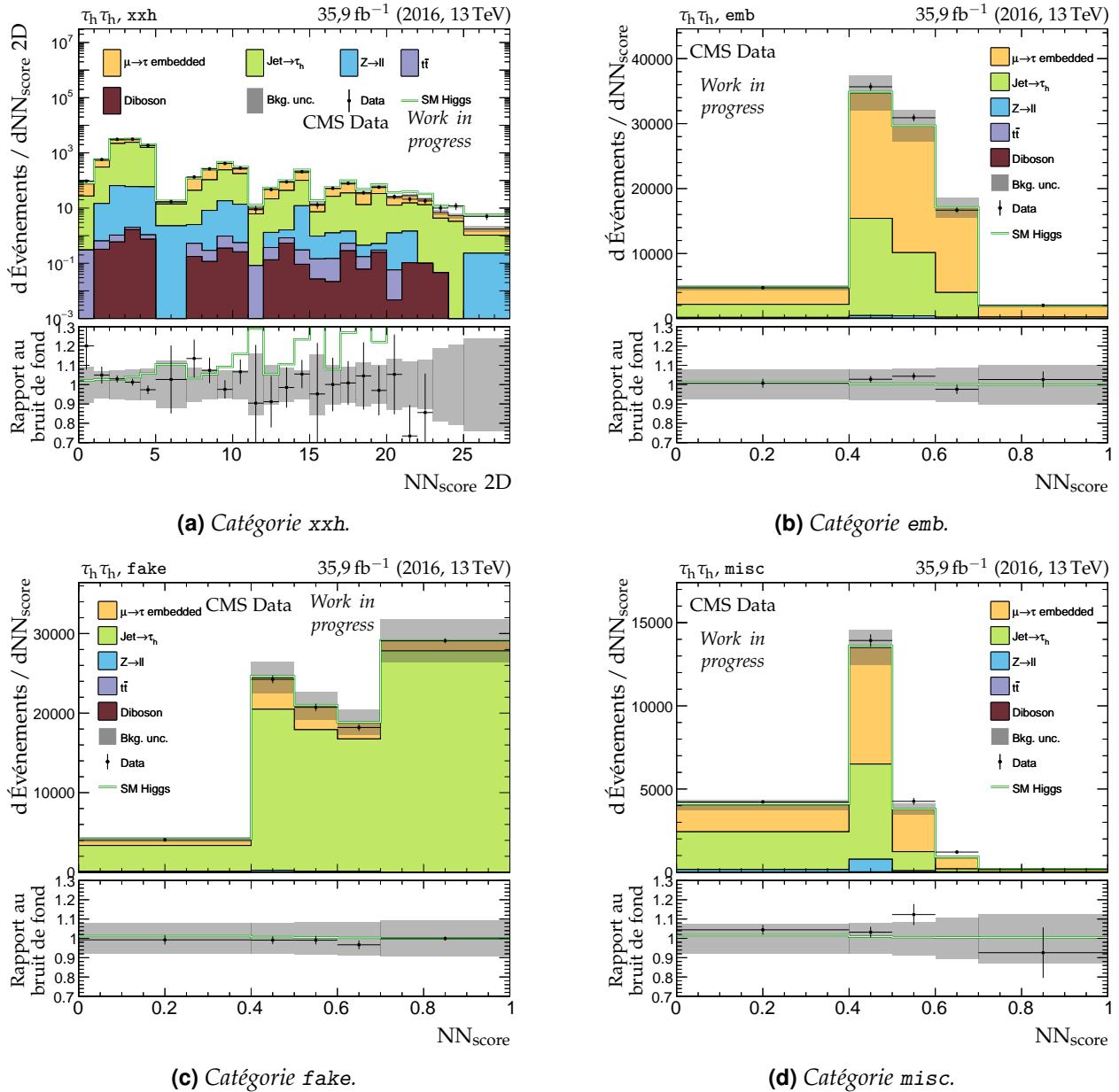


Figure X.1 – Distributions de NN_{score} en 2016 dans le canal $\tau_h \tau_h$.

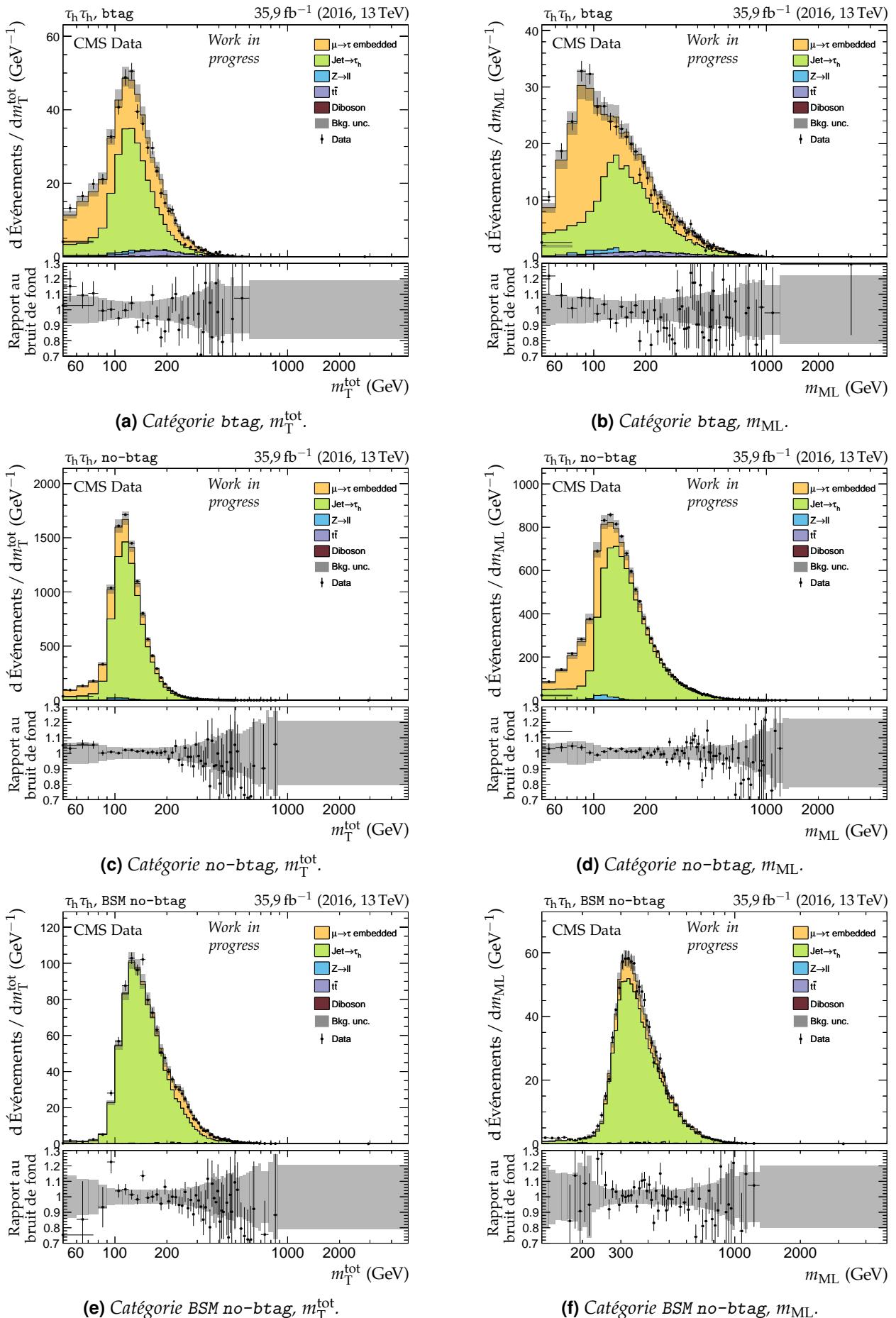


Figure X.2 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $\tau_h \tau_h$.

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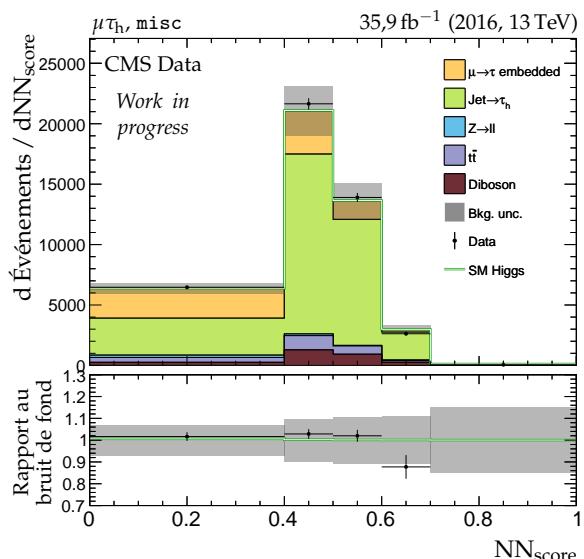
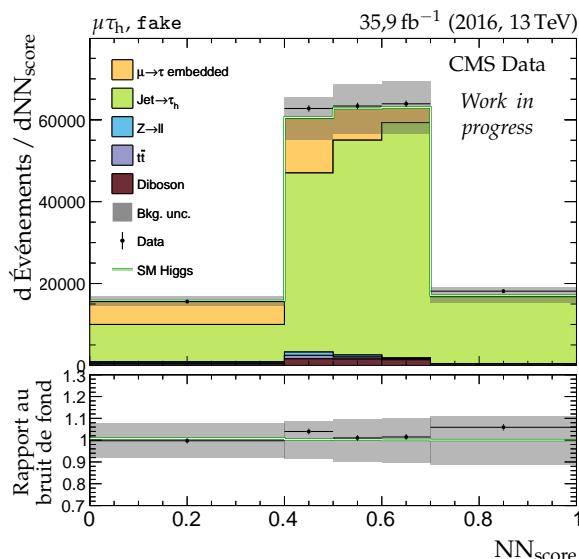
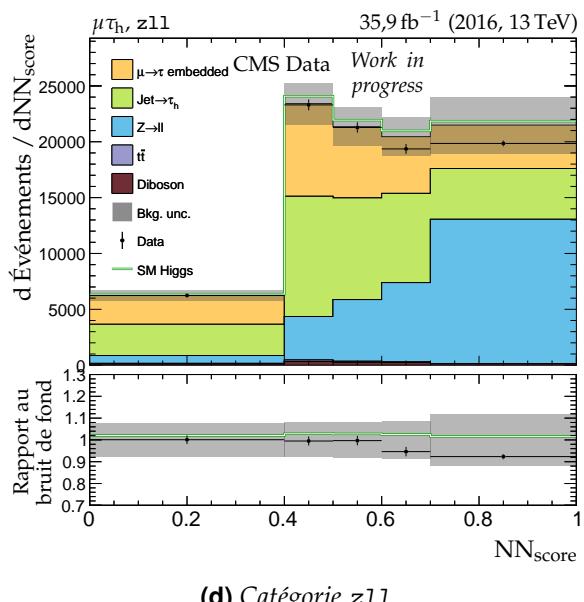
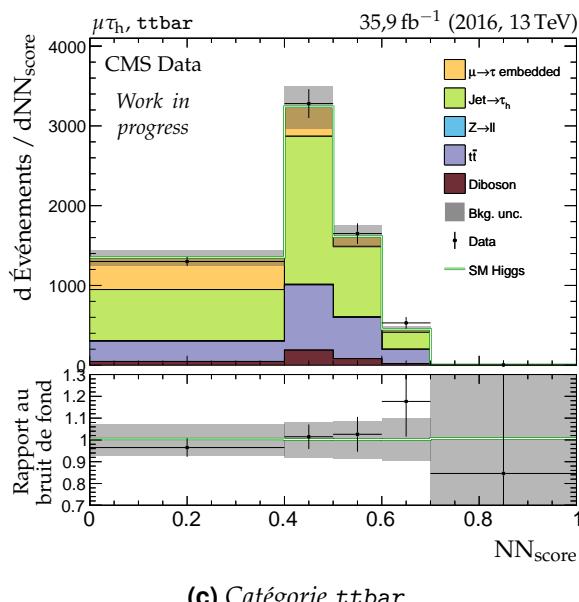
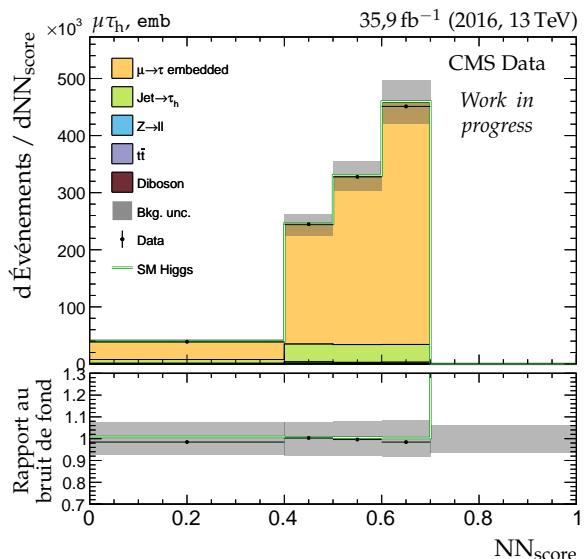
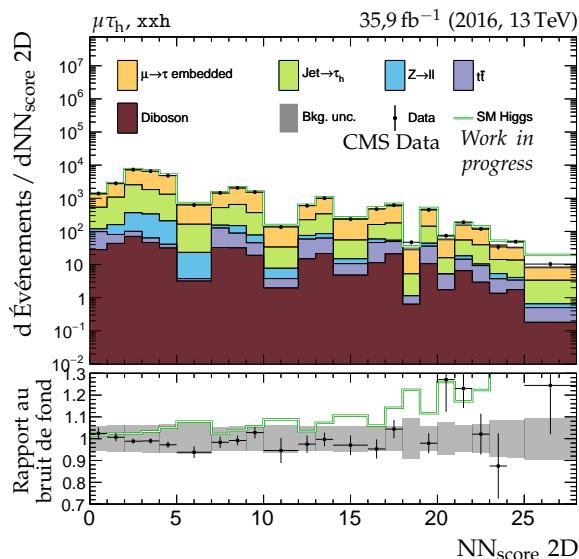


Figure X.3 – Distributions de NN_{score} en 2016 dans le canal $\mu\tau_h$.

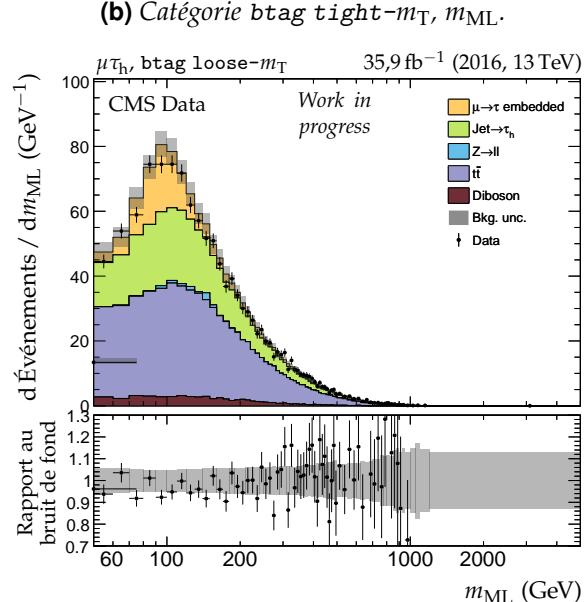
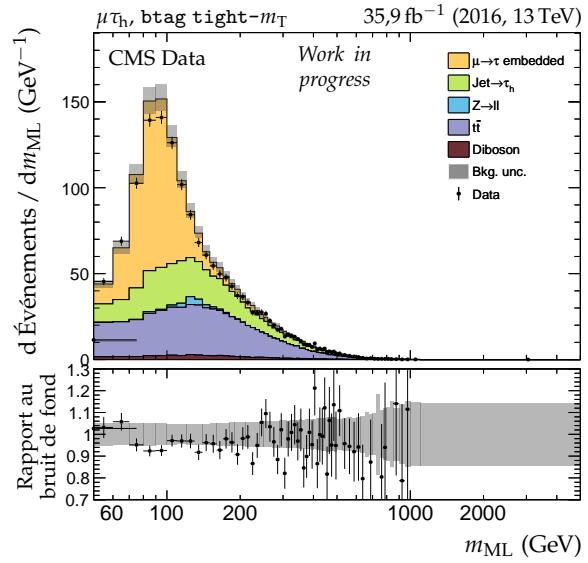
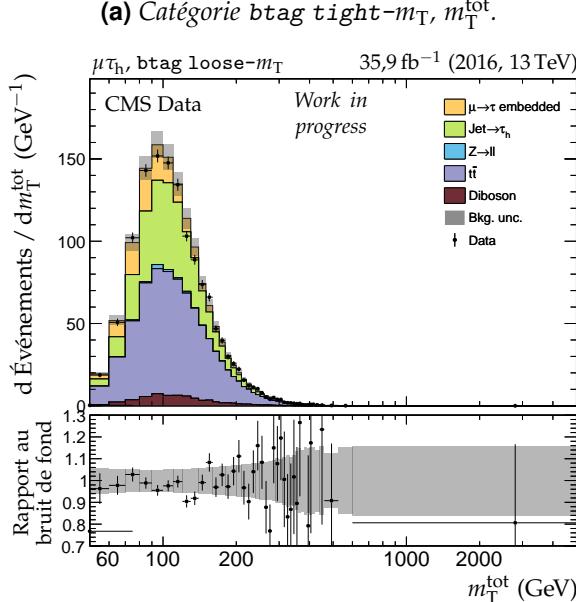
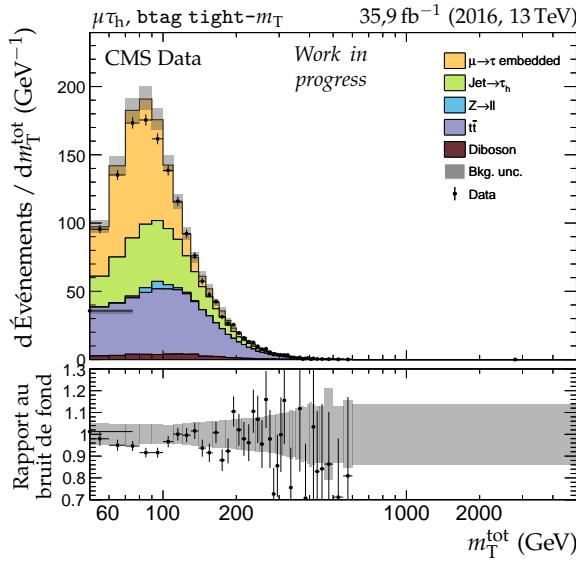


Figure X.4 – Distributions de $m_{\text{T}}^{\text{tot}}$ et m_{ML} en 2016 dans le canal $\mu\tau_h$, catégories $b\text{tag}$.

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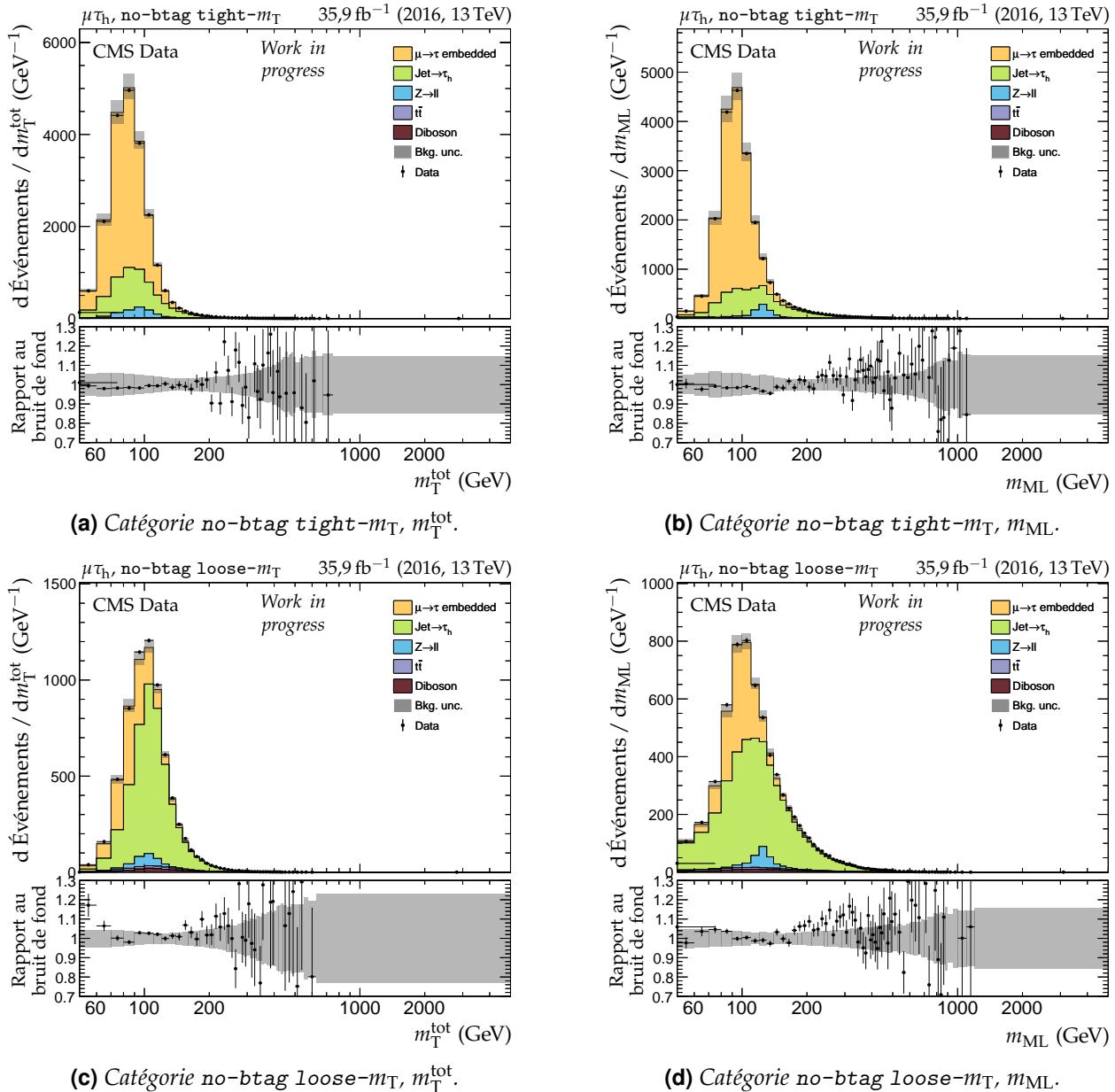


Figure X.5 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $\mu\tau_h$, catégories no-btag.

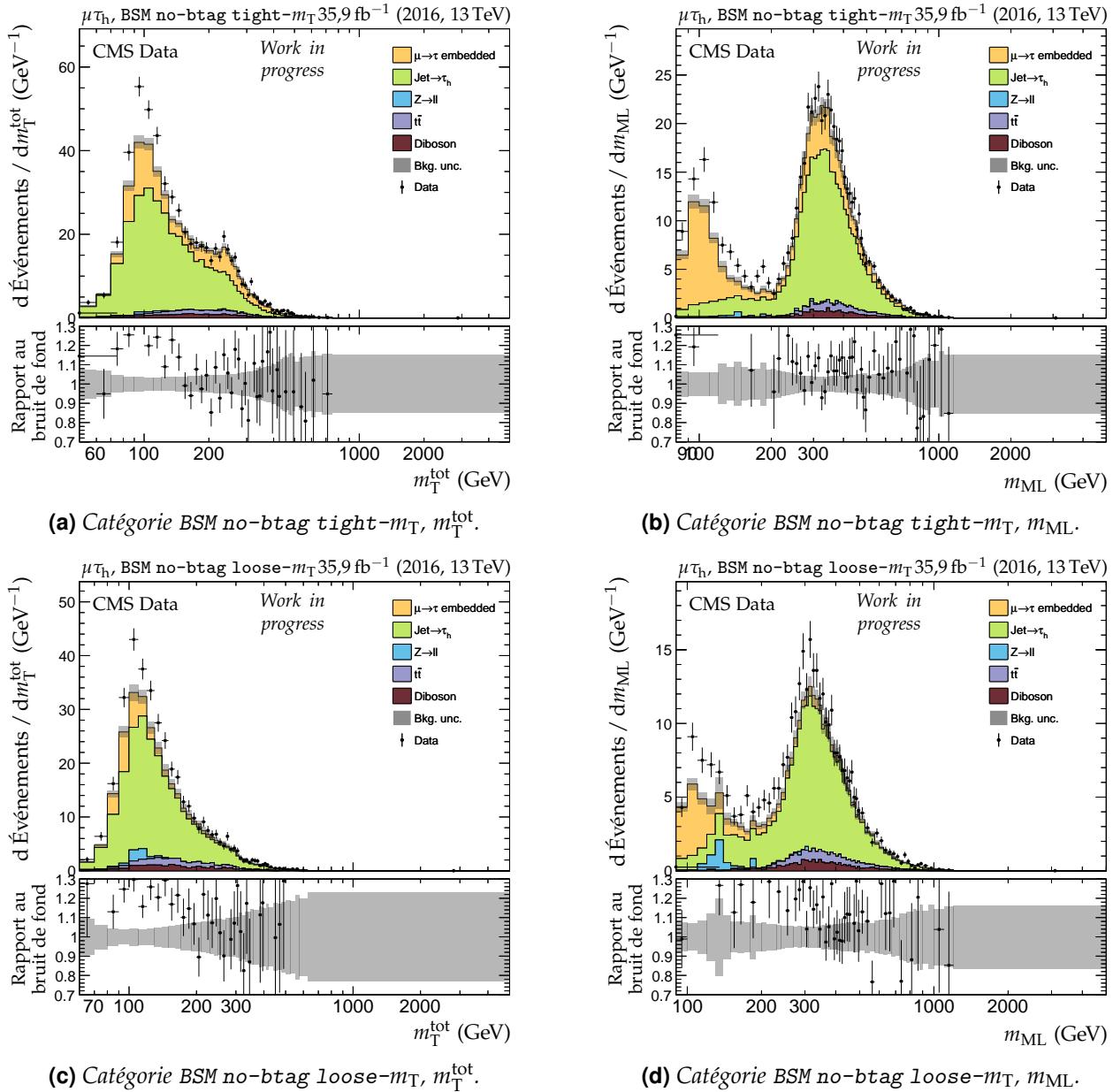
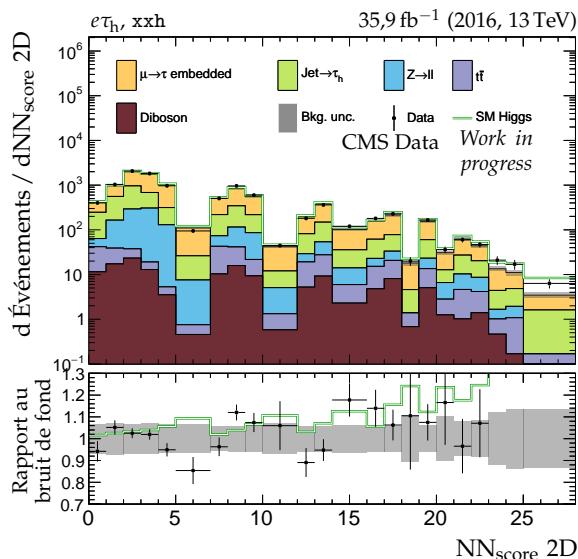
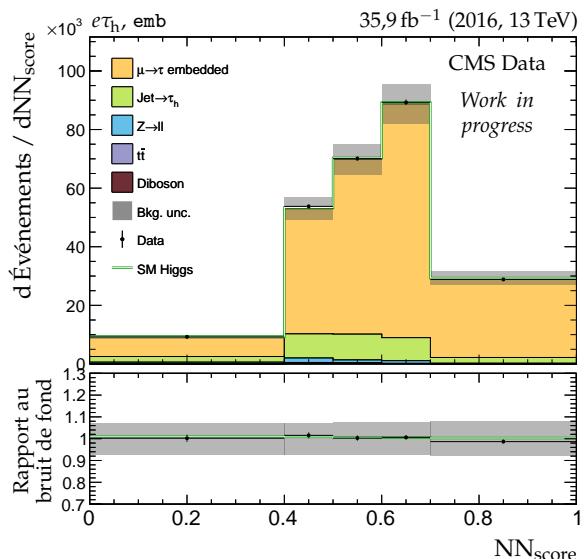


Figure X.6 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $\mu\tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.

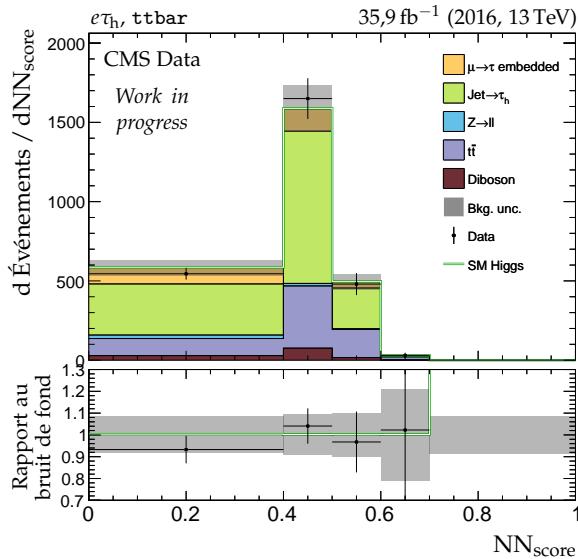
8 ANNEXE X. DISTRIBUTIONS DES VARIABLES DISCRIMINANTES – $H \rightarrow \tau\tau$



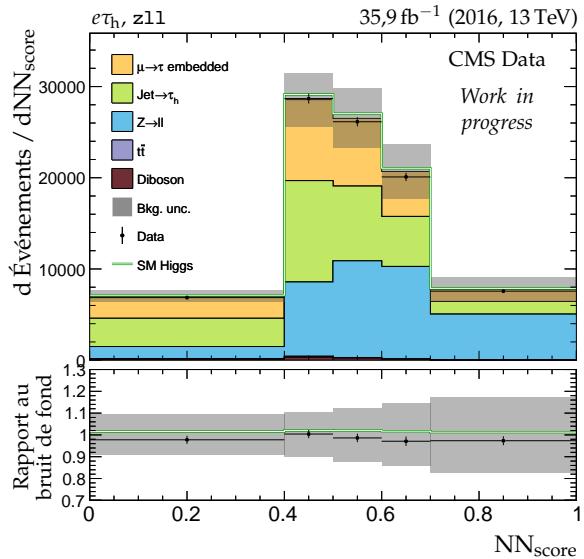
(a) Catégorie xxh .



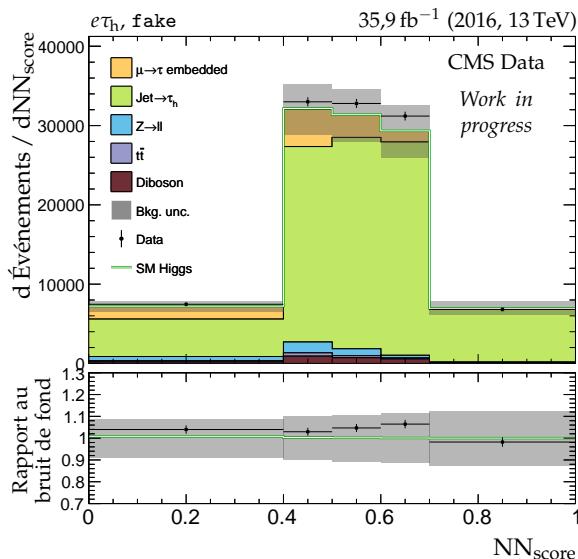
(b) Catégorie emb .



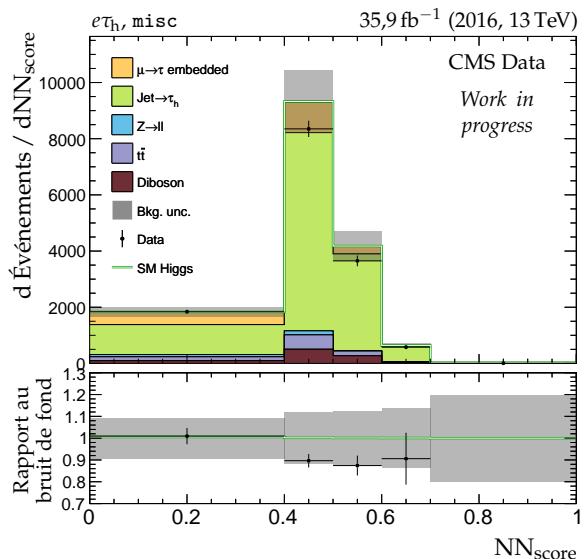
(c) Catégorie $ttbar$.



(d) Catégorie zll .

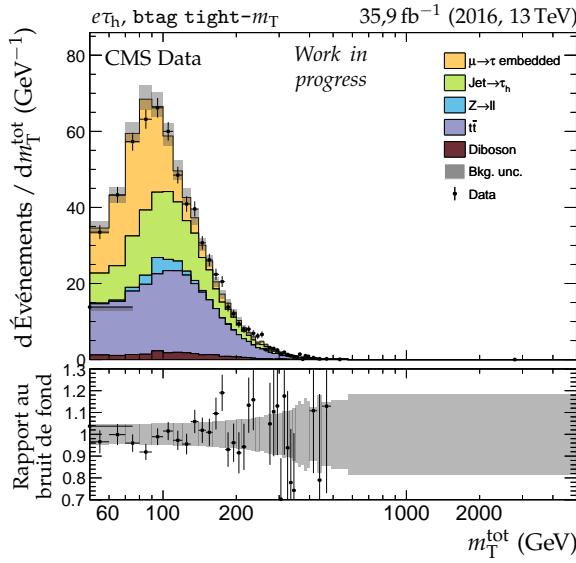


(e) Catégorie $fake$.

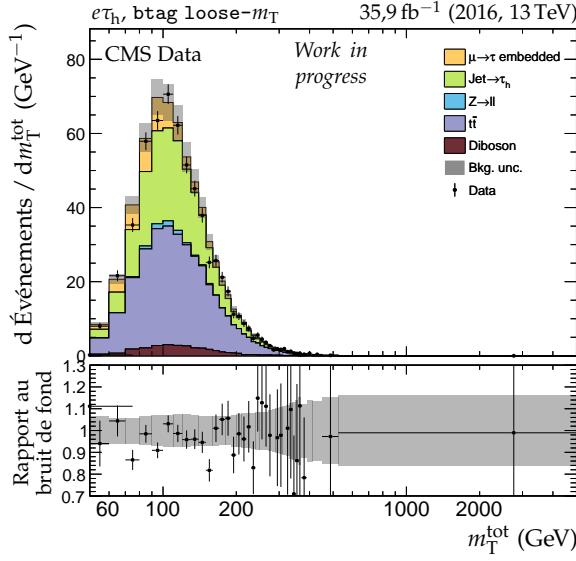


(f) Catégorie $misc$.

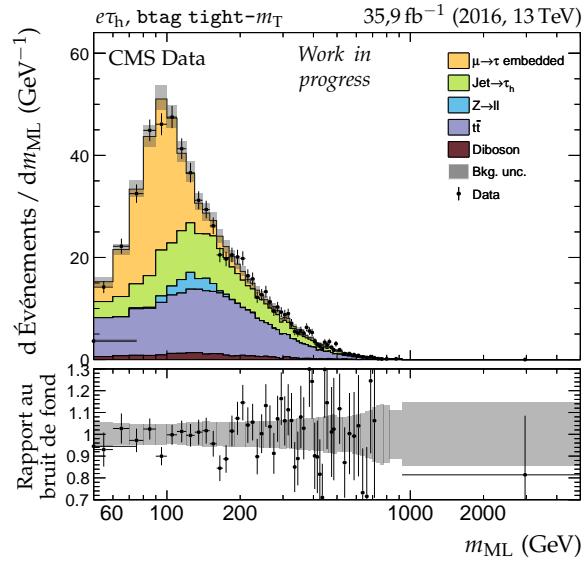
Figure X.7 – Distributions de NN_{score} en 2016 dans le canal $e\tau_h$.



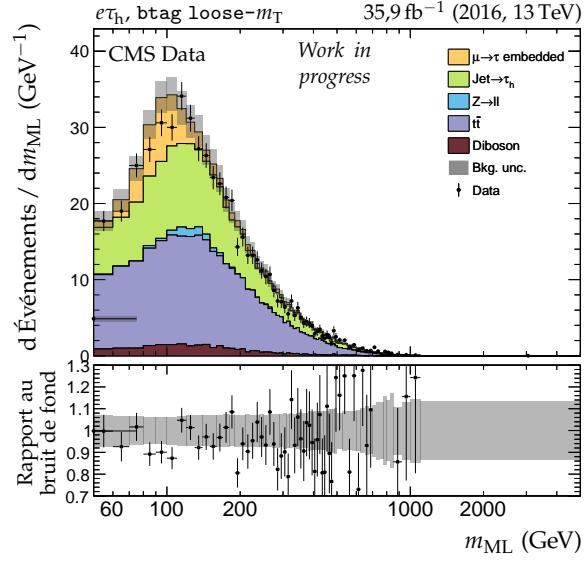
(a) Catégorie btag tight- m_T , m_T^{tot} .



(c) Catégorie btag loose- m_T , m_T^{tot} .

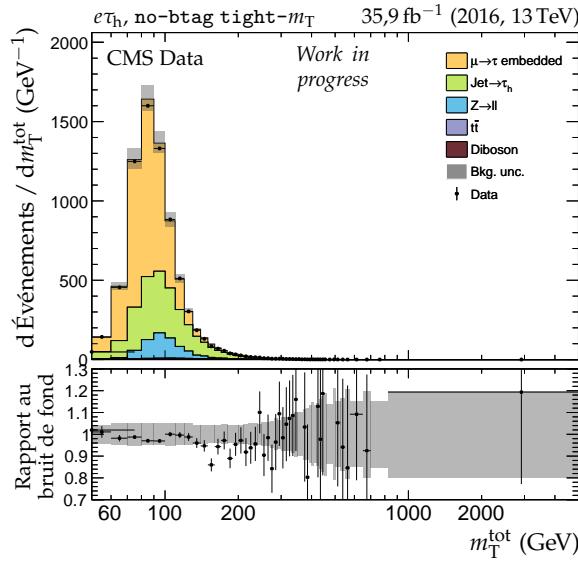


(b) Catégorie btag tight- m_T , m_{ML} .

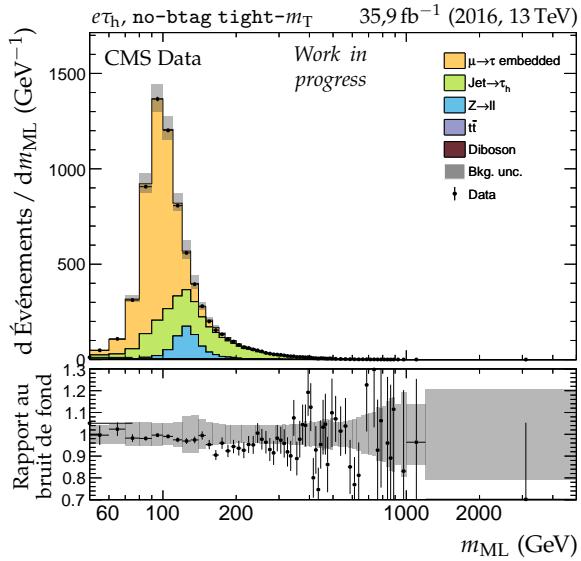


(d) Catégorie btag loose- m_T , m_{ML} .

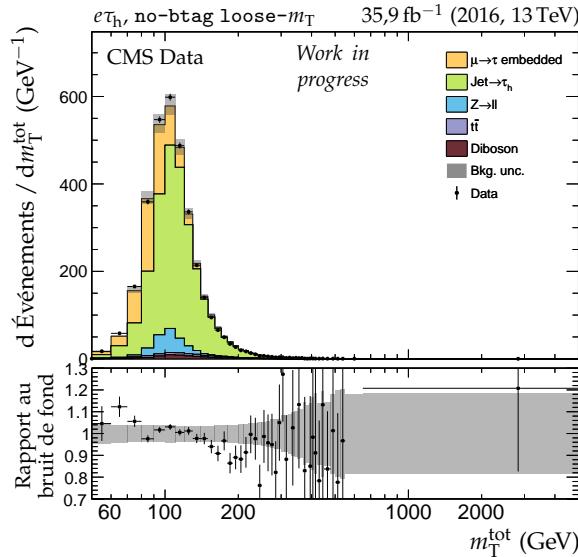
Figure X.8 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\tau_h$, catégories btag.



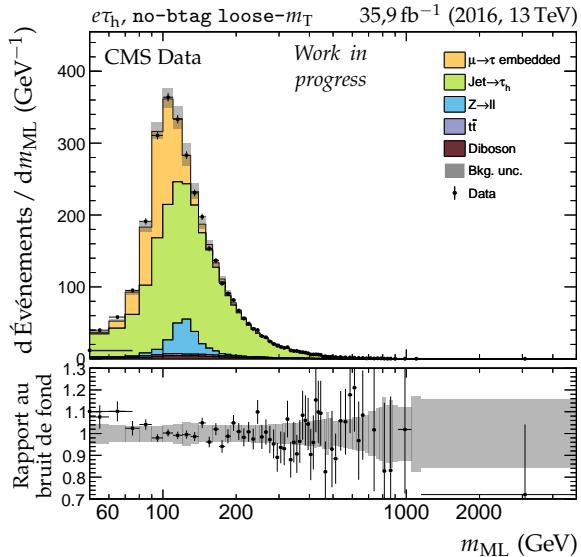
(a) Catégorie no-btag tight- m_T , m_T^{tot} .



(b) Catégorie no-btag tight- m_T , m_{ML} .



(c) Catégorie no-btag loose- m_T , m_T^{tot} .



(d) Catégorie no-btag loose- m_T , m_{ML} .

Figure X.9 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\tau_h$, catégories no-btag.

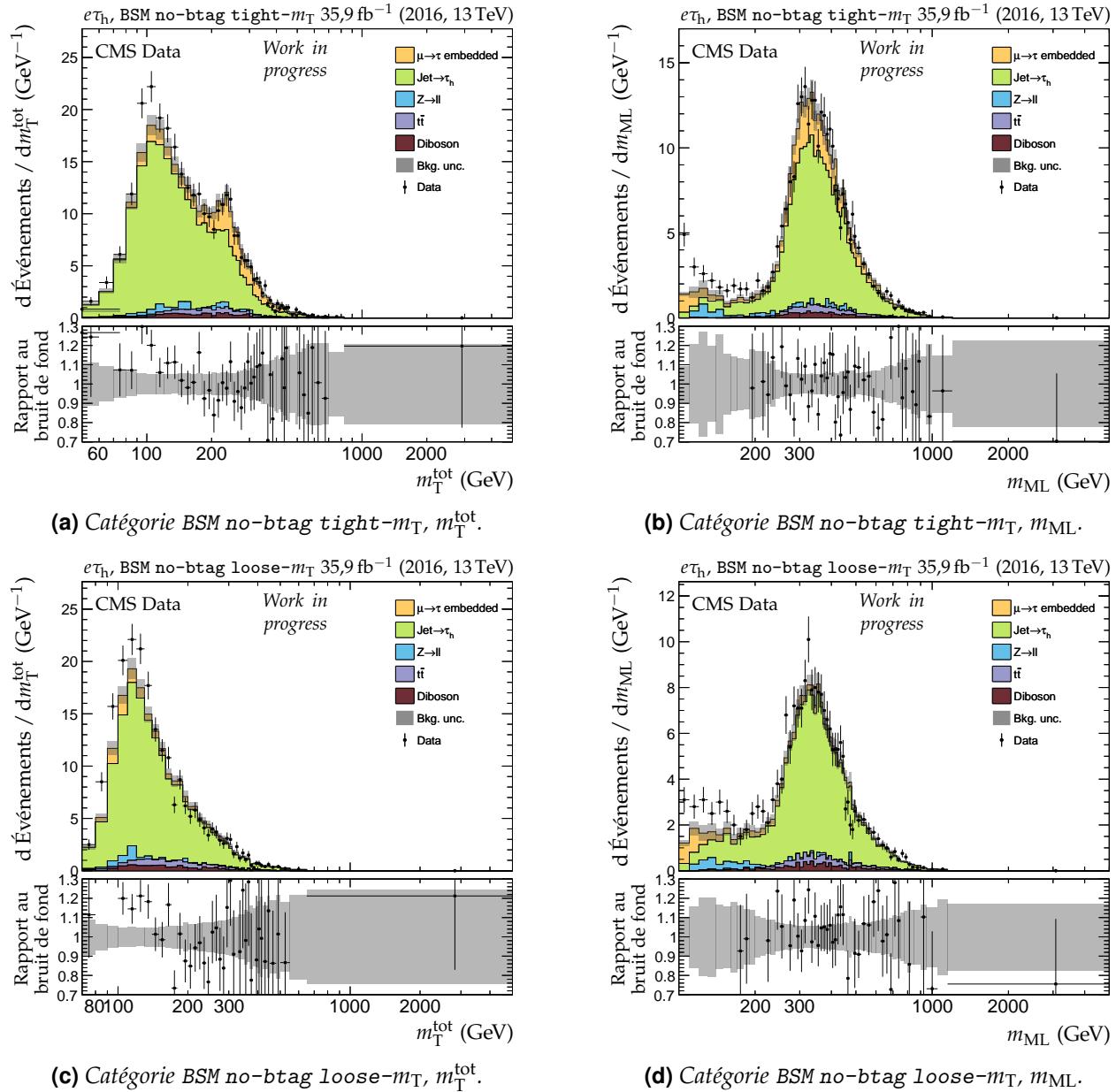
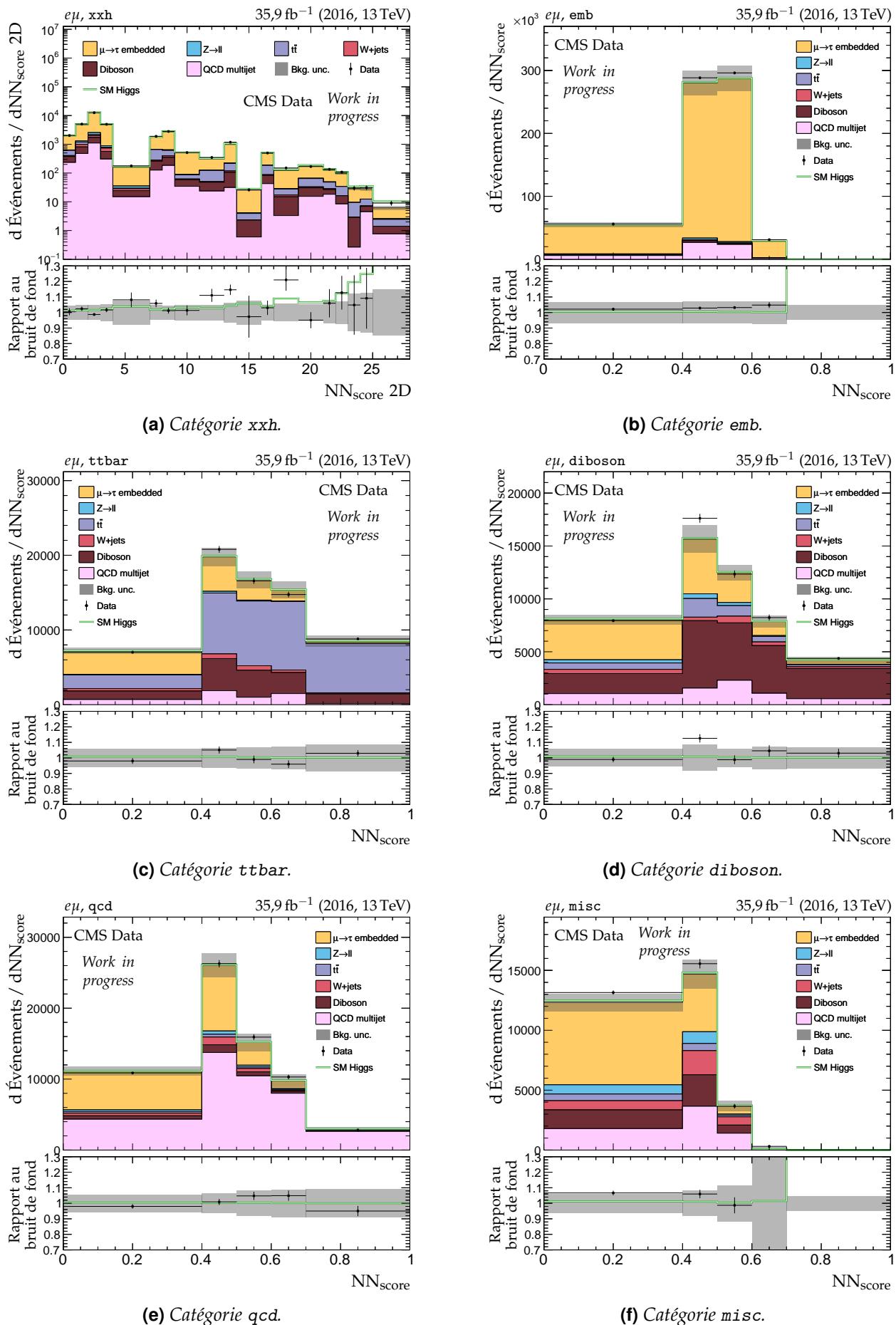


Figure X.10 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.


 Figure X.11 – Distributions de NN_{score} en 2016 dans le canal $e\mu$.

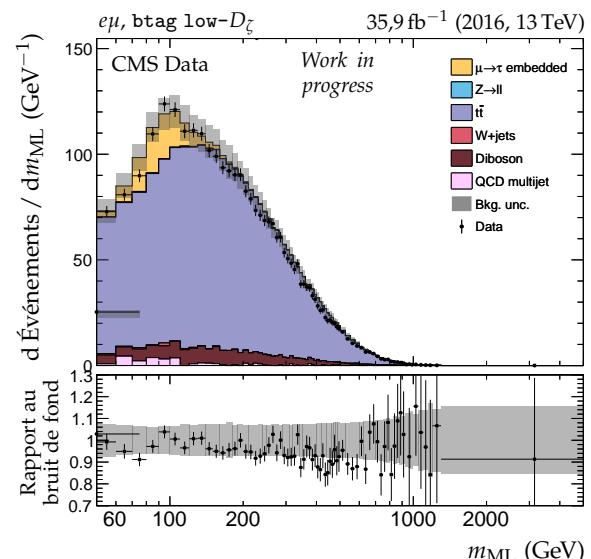
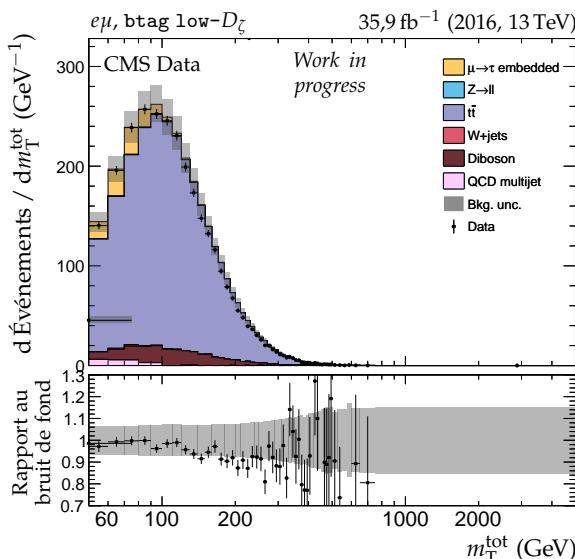
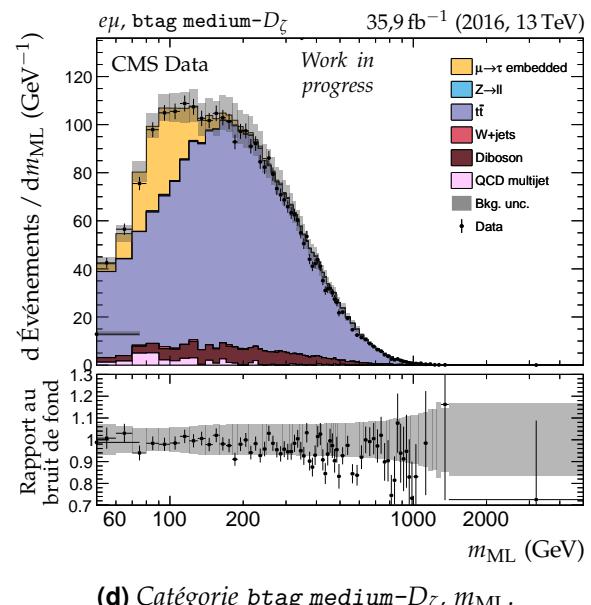
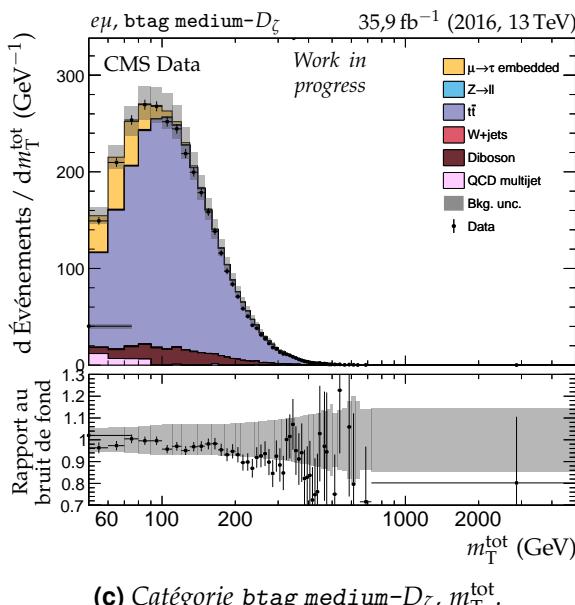
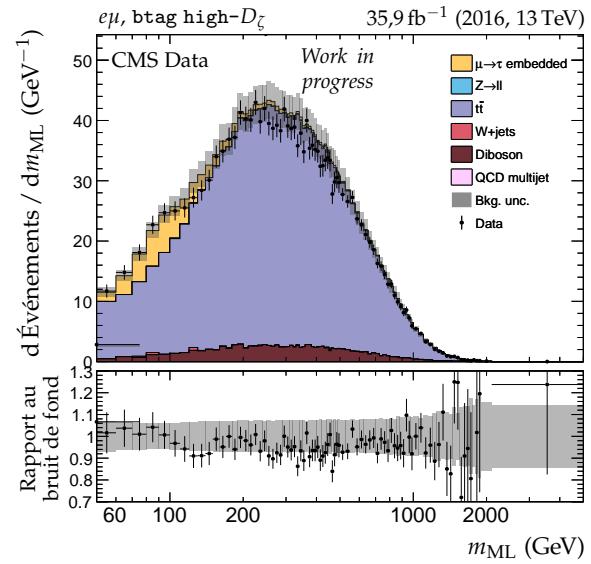
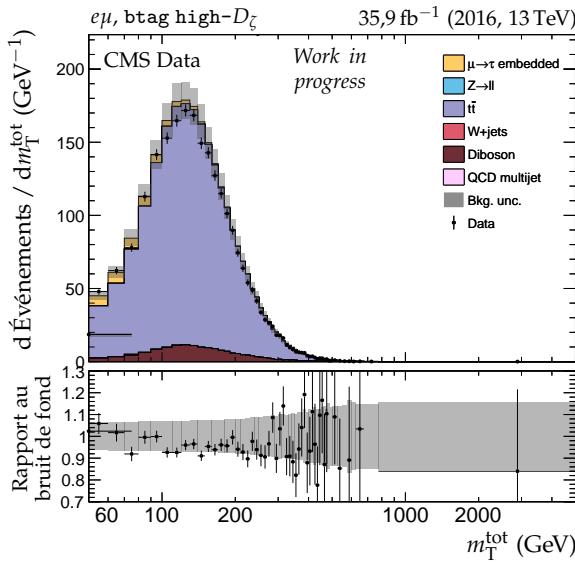
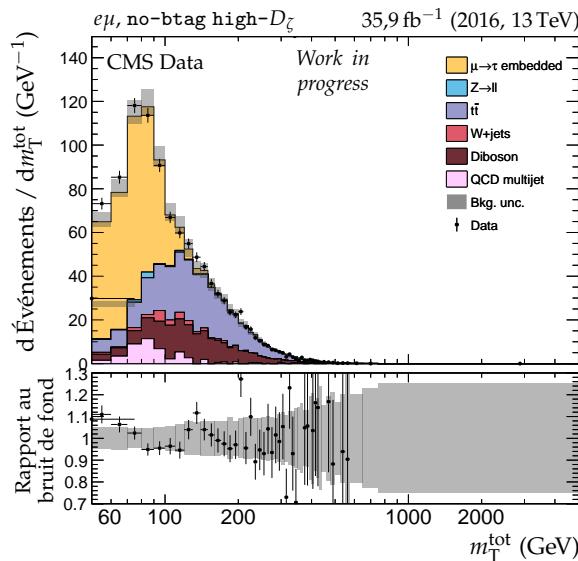
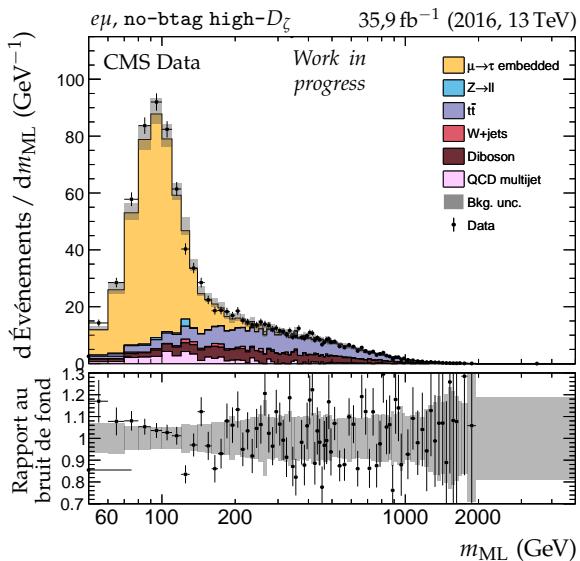
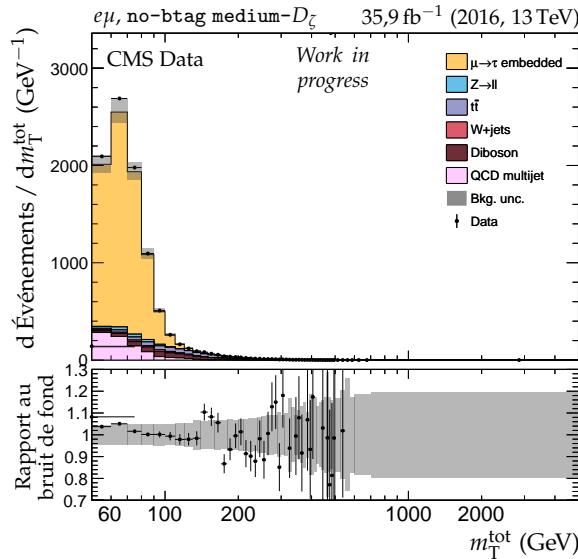
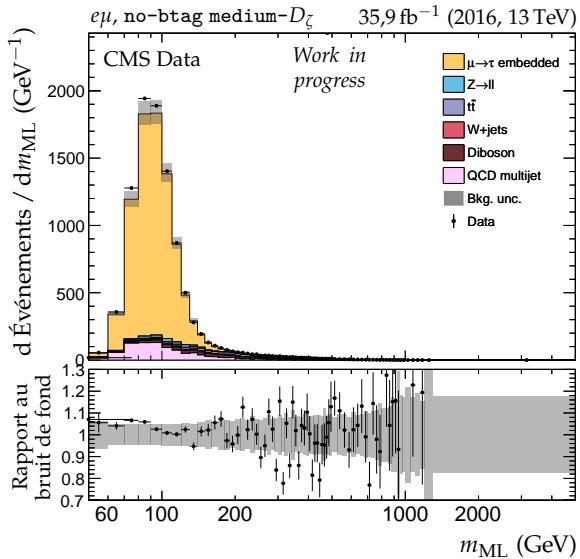
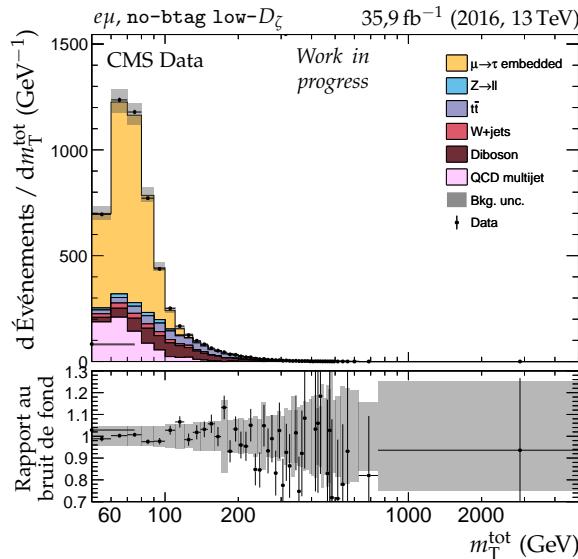
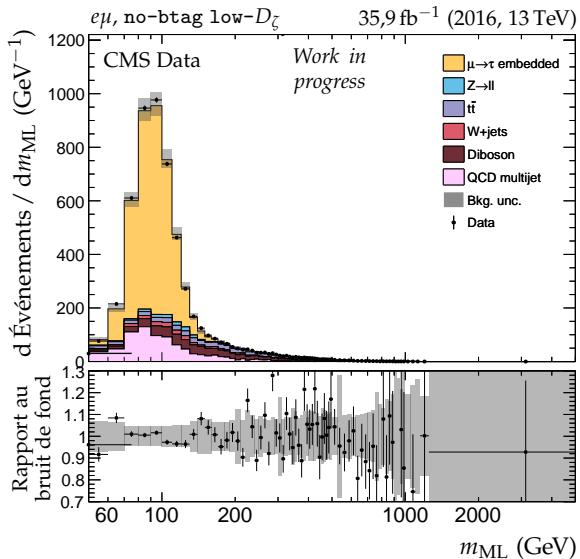


Figure X.12 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\mu$, catégories $b\text{tag}$.

(a) Catégorie no-btag high- D_ζ , m_T^{tot} .(b) Catégorie no-btag high- D_ζ , m_{ML} .(c) Catégorie no-btag medium- D_ζ , m_T^{tot} .(d) Catégorie no-btag medium- D_ζ , m_{ML} .(e) Catégorie no-btag low- D_ζ , m_T^{tot} .(f) Catégorie no-btag low- D_ζ , m_{ML} .**Figure X.13 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\mu$, catégories no-btag.**

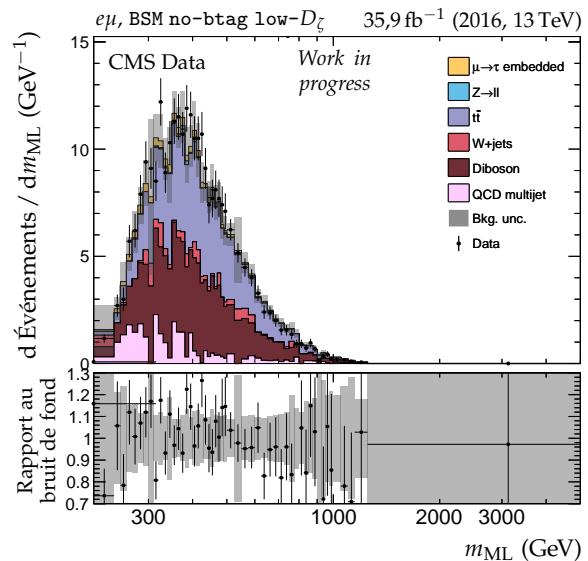
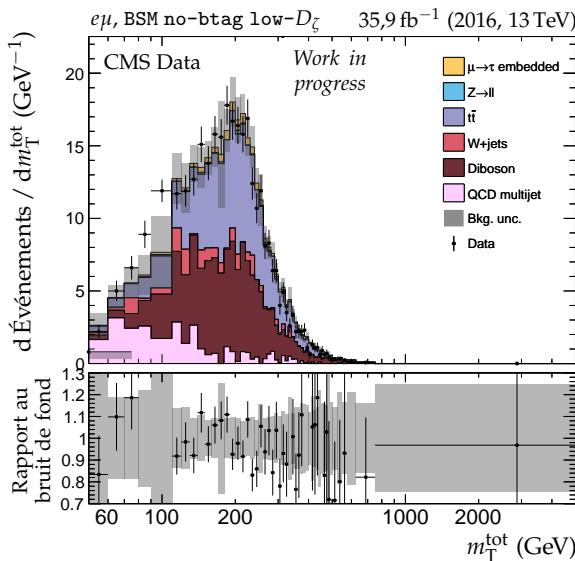
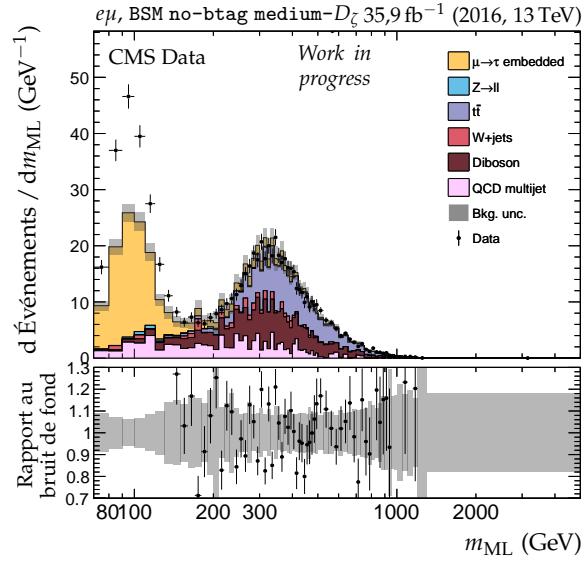
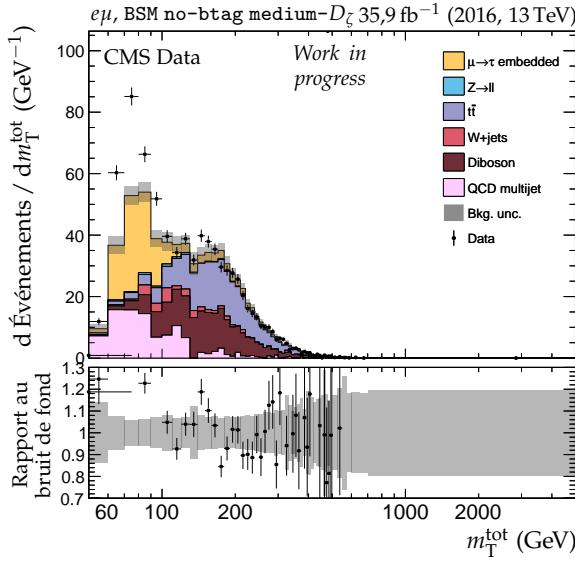
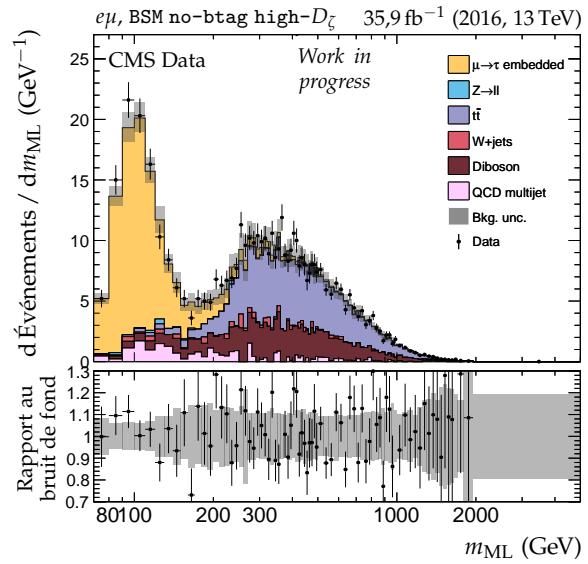
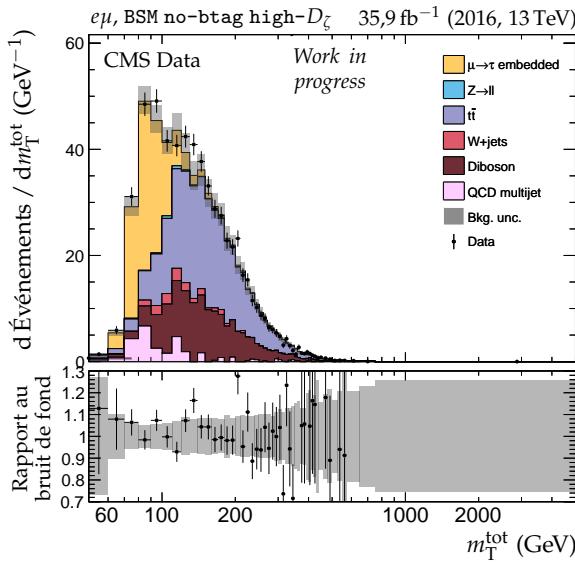
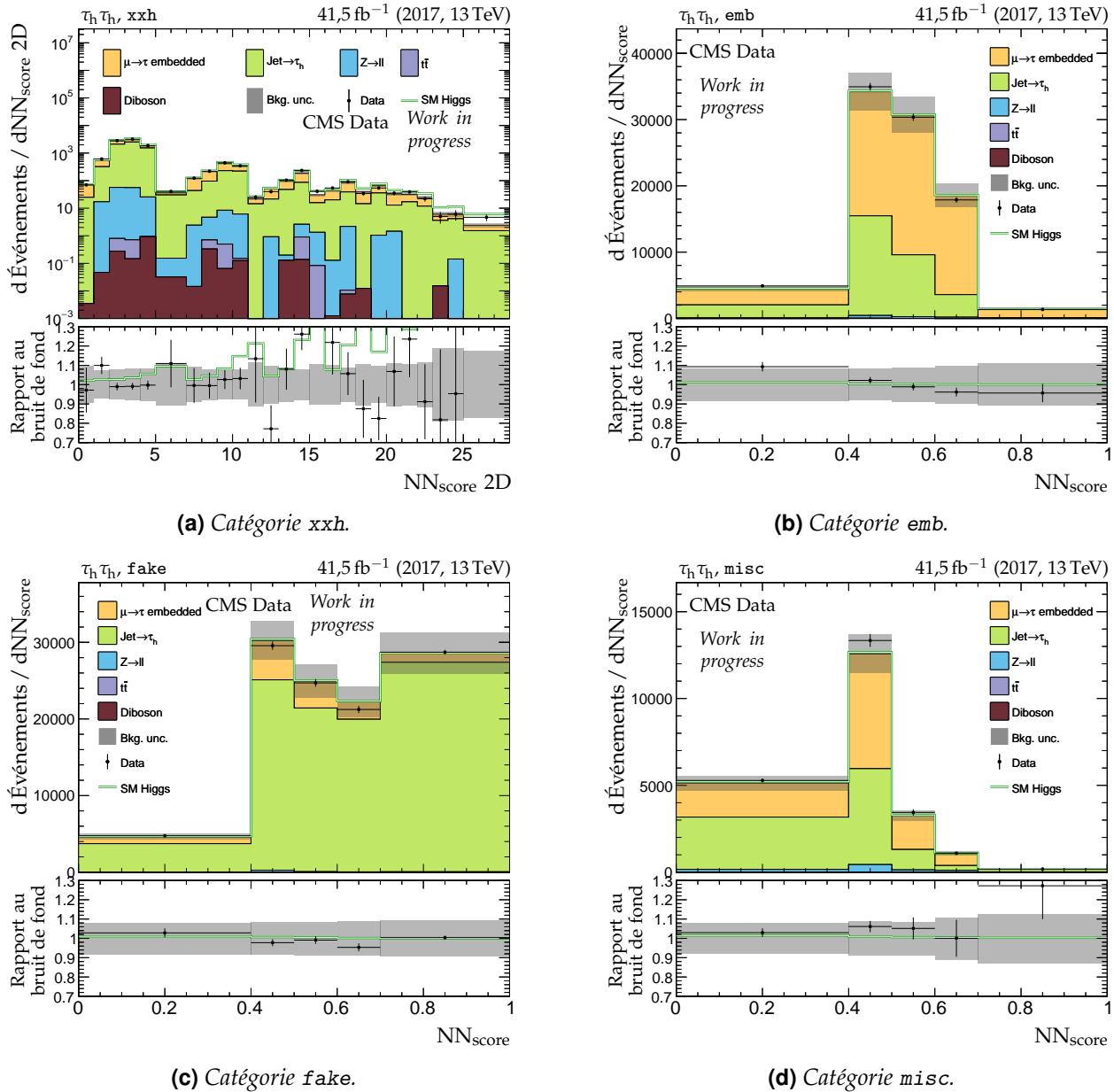
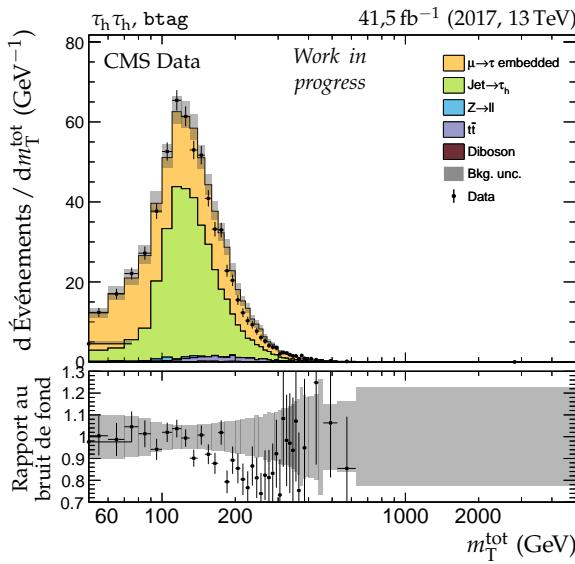
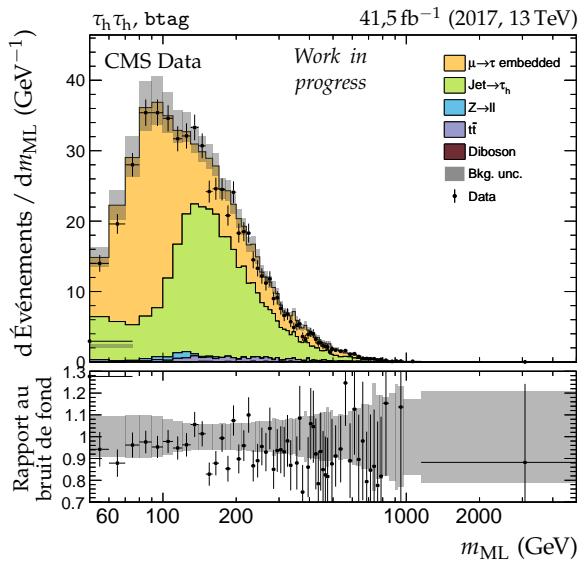
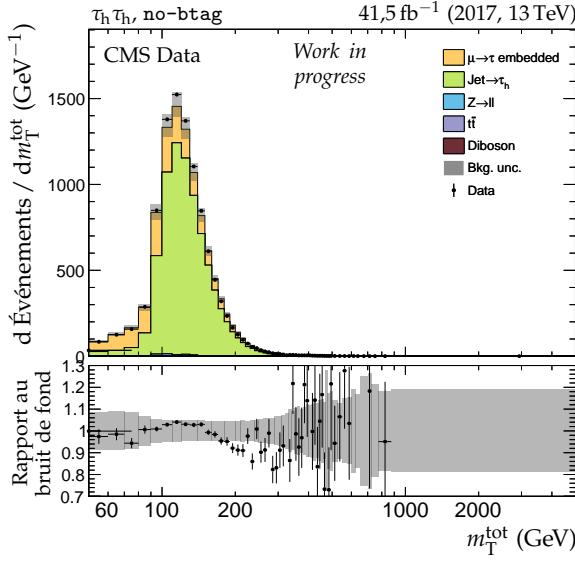
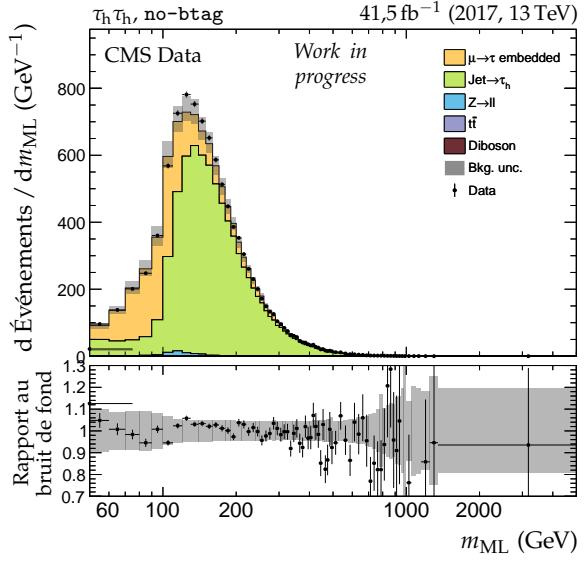
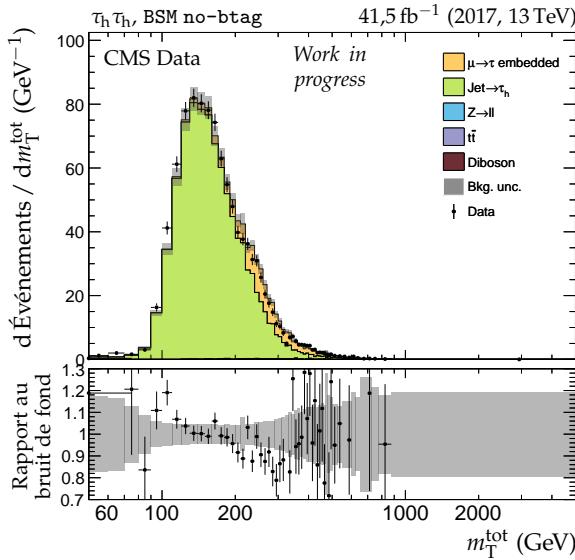
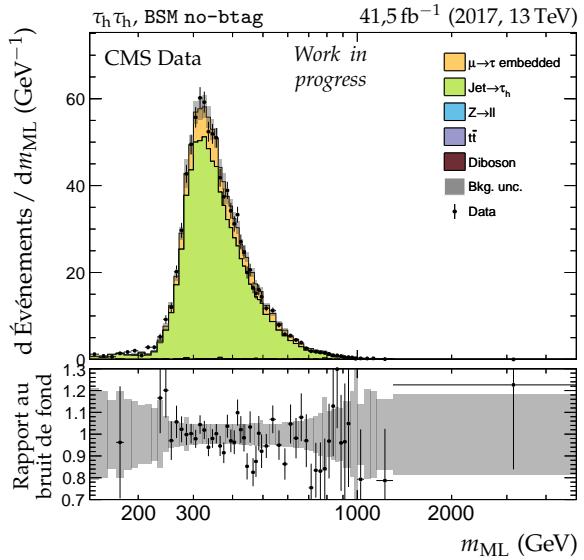
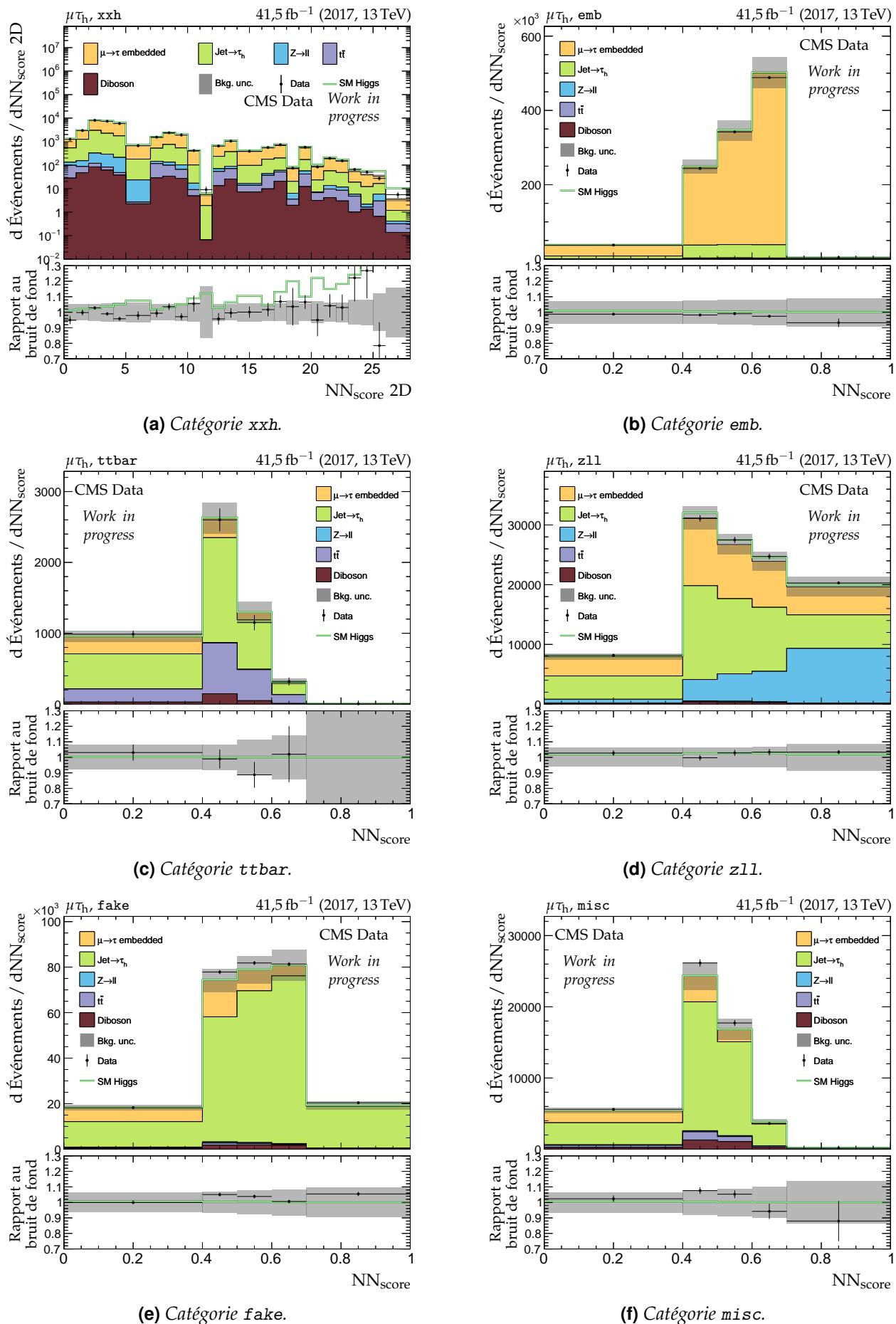


Figure X.14 – Distributions de m_T^{tot} et m_{ML} en 2016 dans le canal $e\mu$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.



(a) Catégorie btag, m_T^{tot} .(b) Catégorie btag, m_{ML} .(c) Catégorie no-btag, m_T^{tot} .(d) Catégorie no-btag, m_{ML} .(e) Catégorie BSM no-btag, m_T^{tot} .(f) Catégorie BSM no-btag, m_{ML} .**Figure X.16** – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $\tau_h \tau_h$.



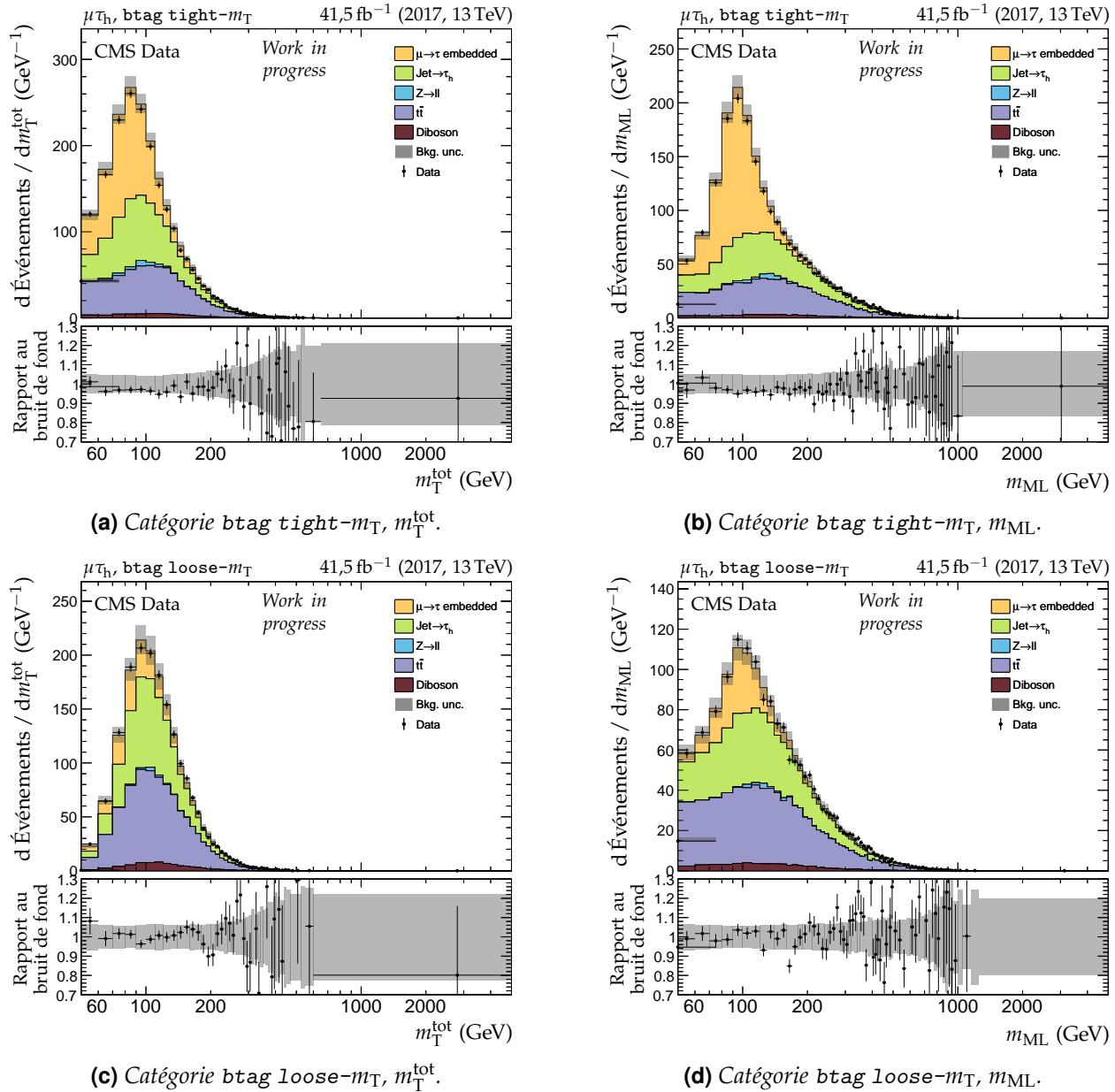
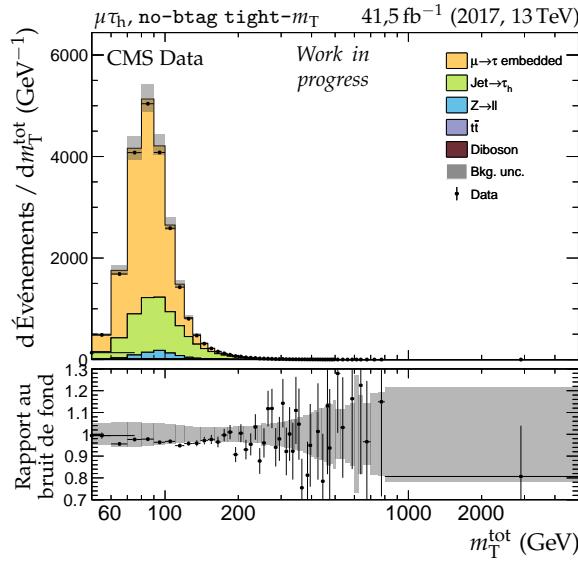
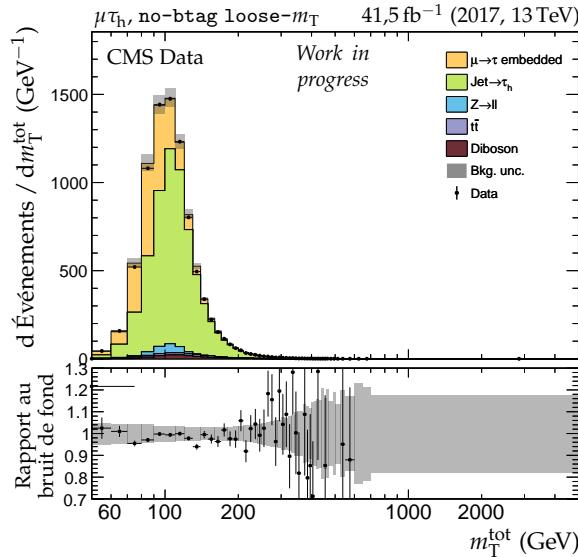
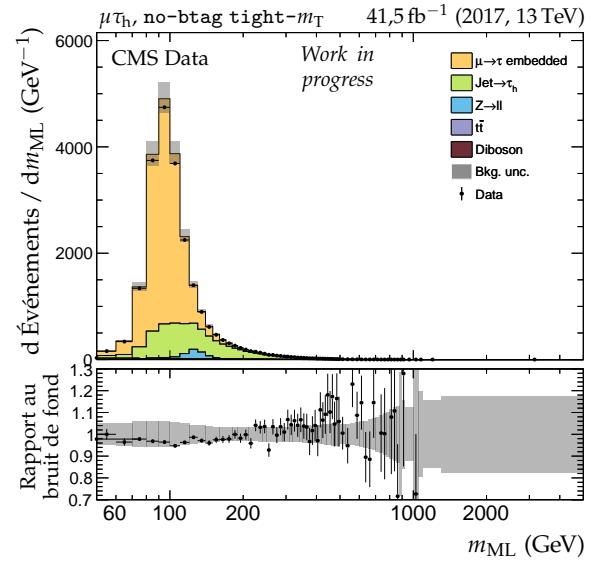
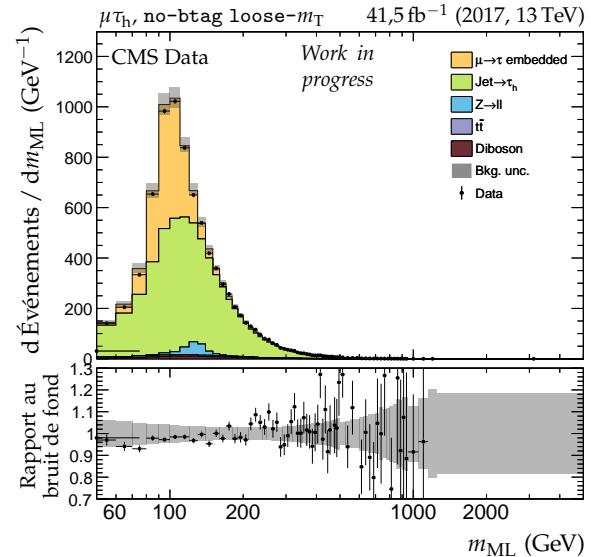


Figure X.18 – Distributions de $m_{\text{T}}^{\text{tot}}$ et m_{ML} en 2017 dans le canal $\mu\tau_h$, catégories $b\text{tag}$.

(a) Catégorie no-btag tight- m_T , m_T^{tot} .(c) Catégorie no-btag loose- m_T , m_T^{tot} .(b) Catégorie no-btag tight- m_T , m_{ML} .(d) Catégorie no-btag loose- m_T , m_{ML} .**Figure X.19** – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $\mu\tau_h$, catégories no-btag.

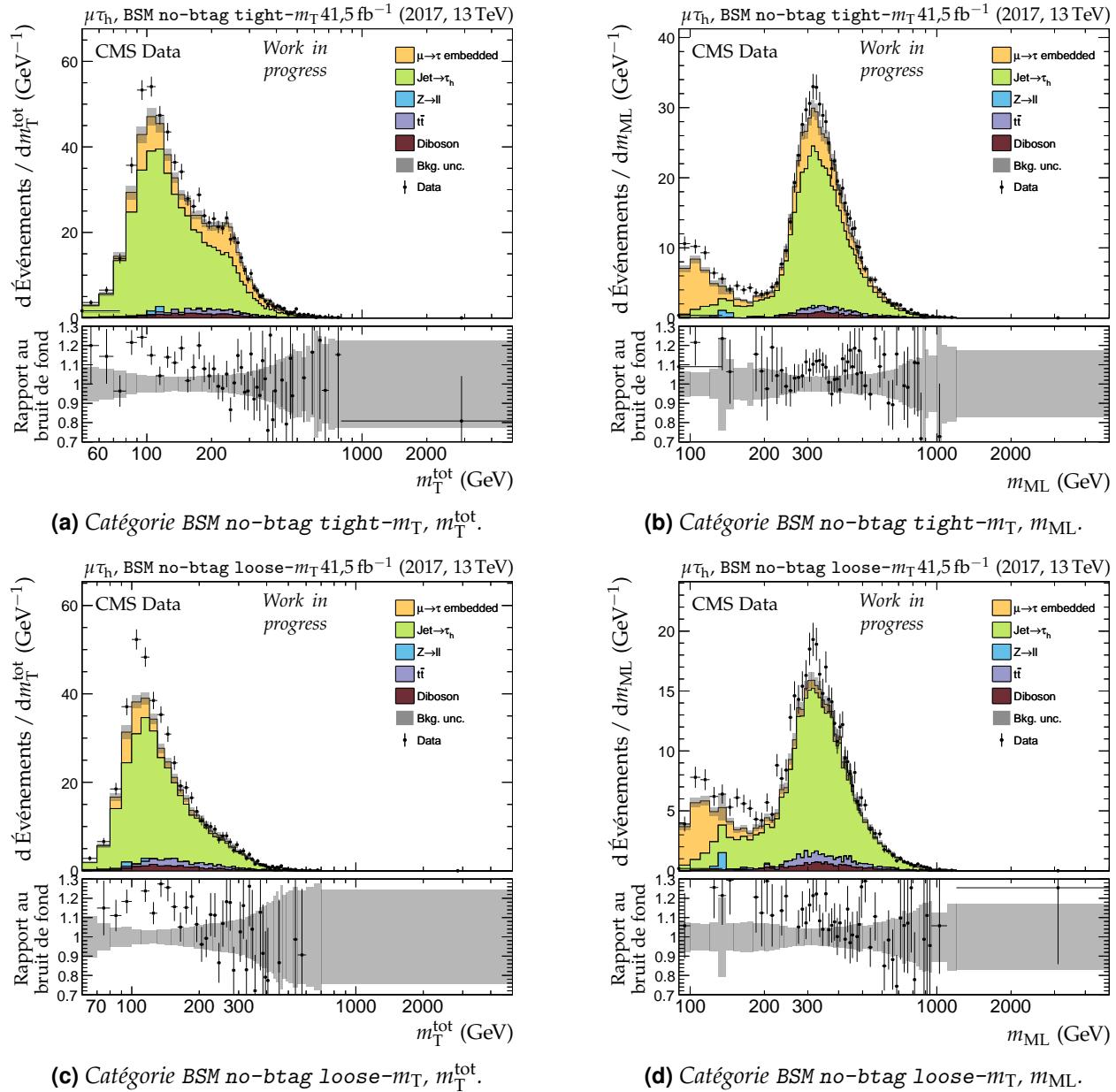
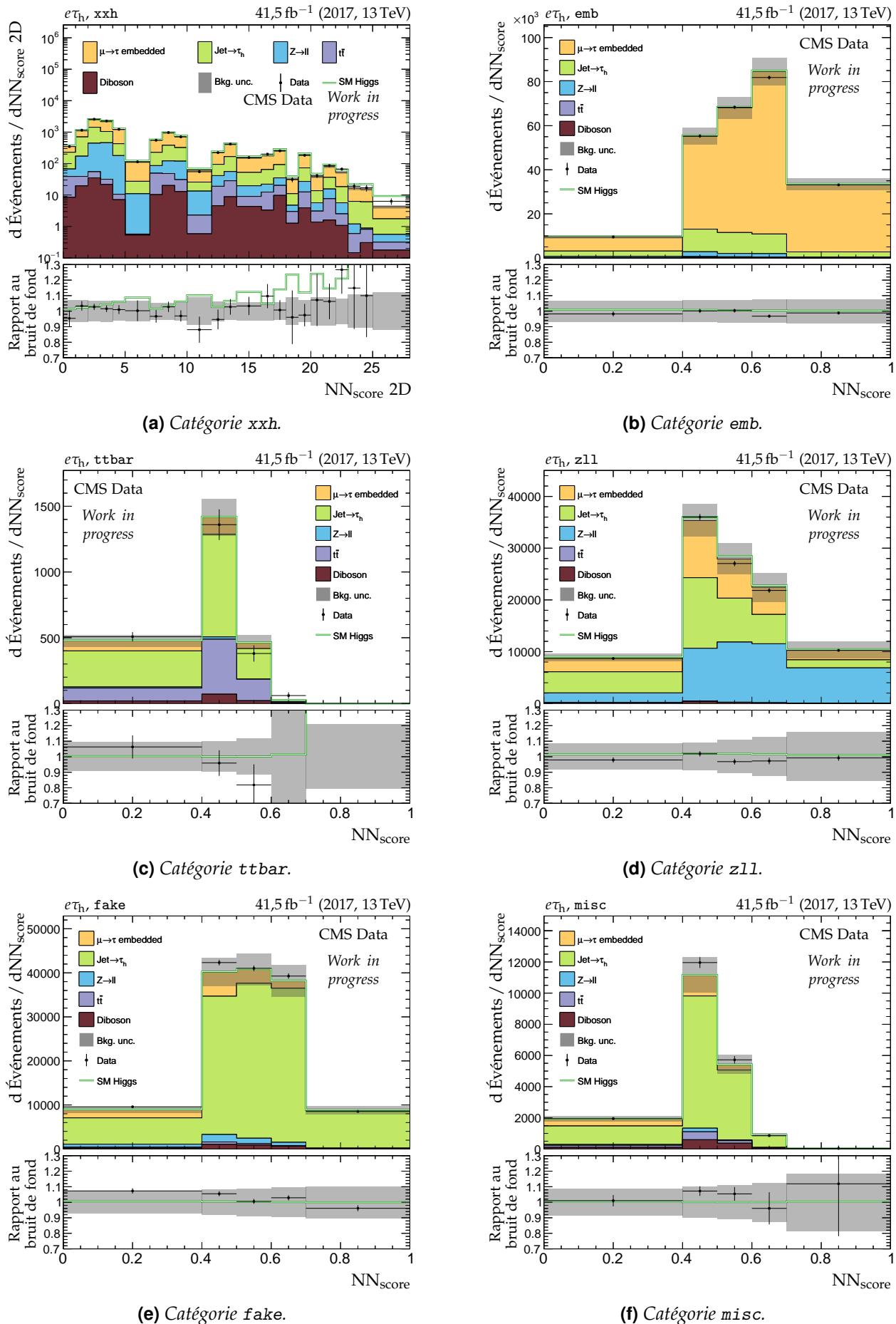


Figure X.20 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $\mu\tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.


 Figure X.21 – Distributions de NN_{score} en 2017 dans le canal $e\tau_h$.

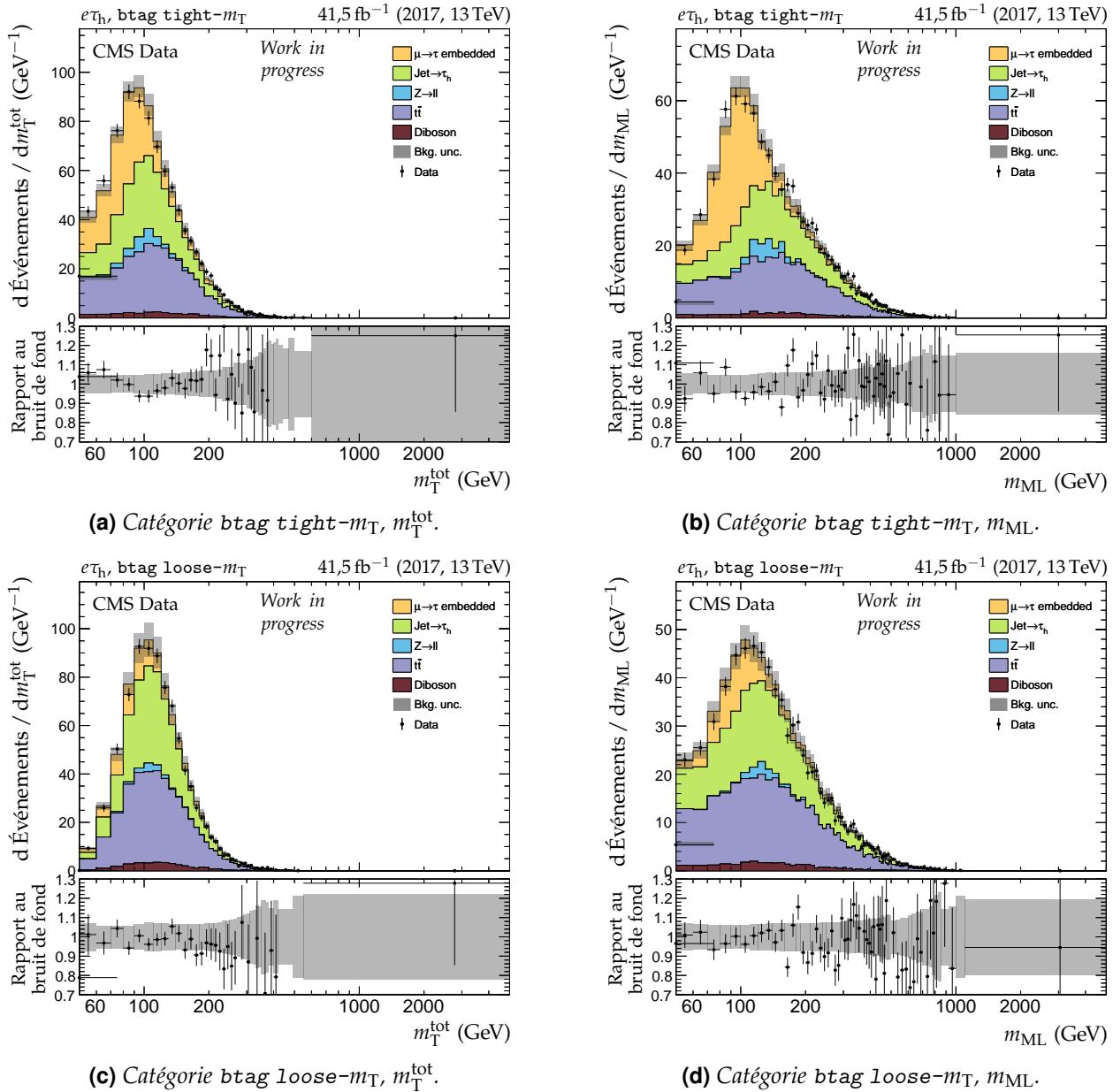
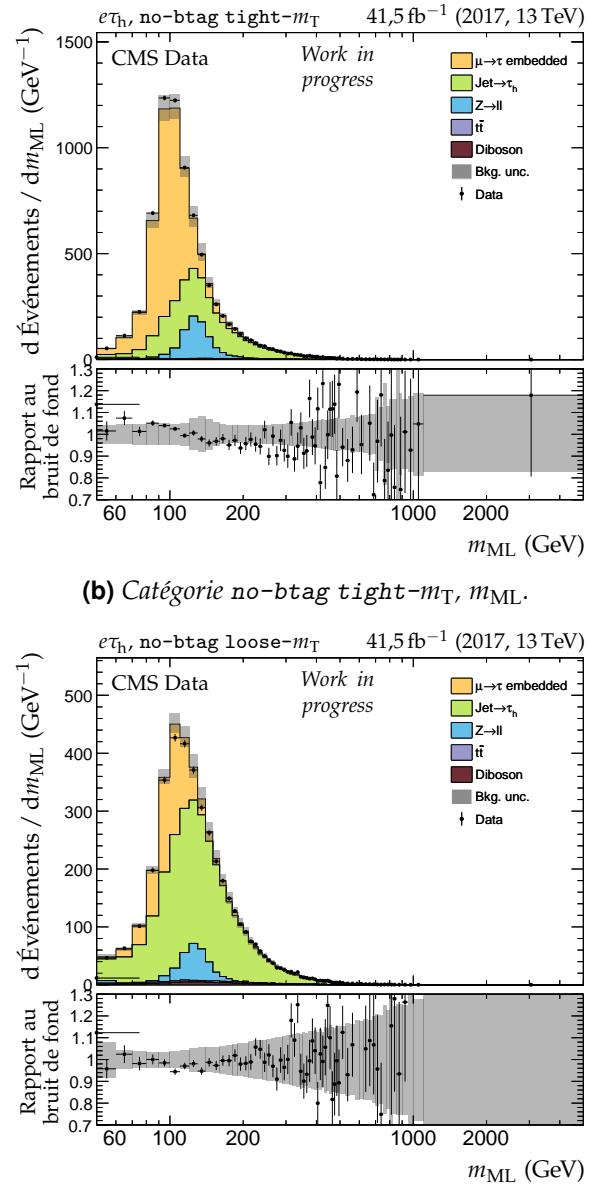
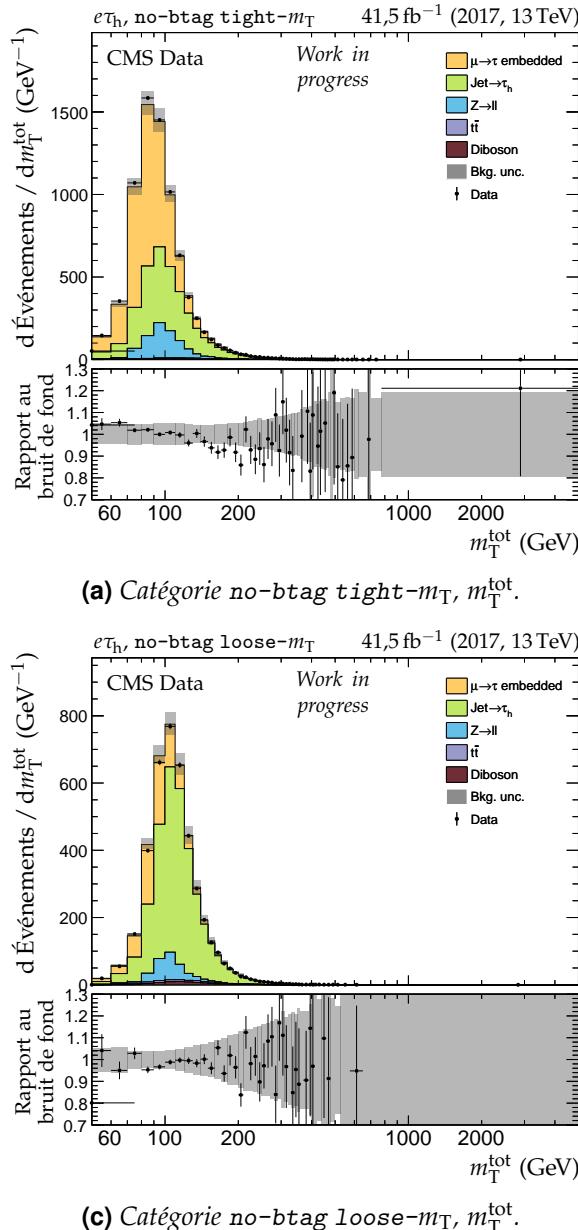


Figure X.22 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $e\tau_h$, catégories btag.



(c) Catégorie no-btag loose- m_T , m_T^{tot} .

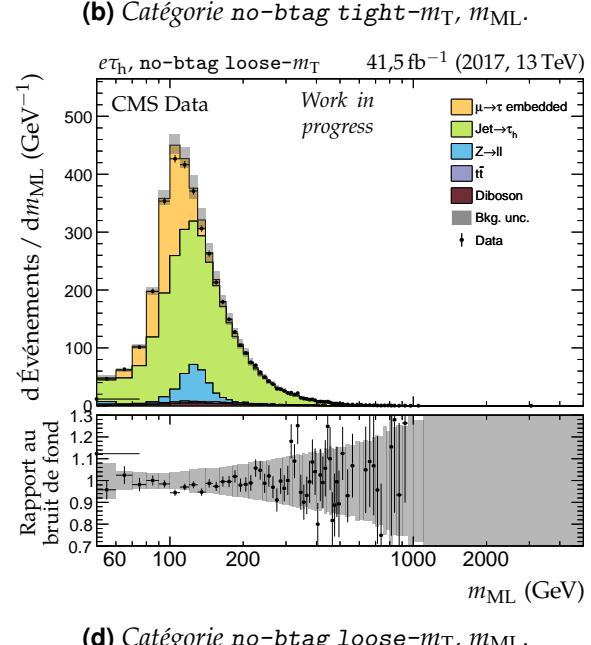


Figure X.23 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $e\tau_h$, catégories no-btag.

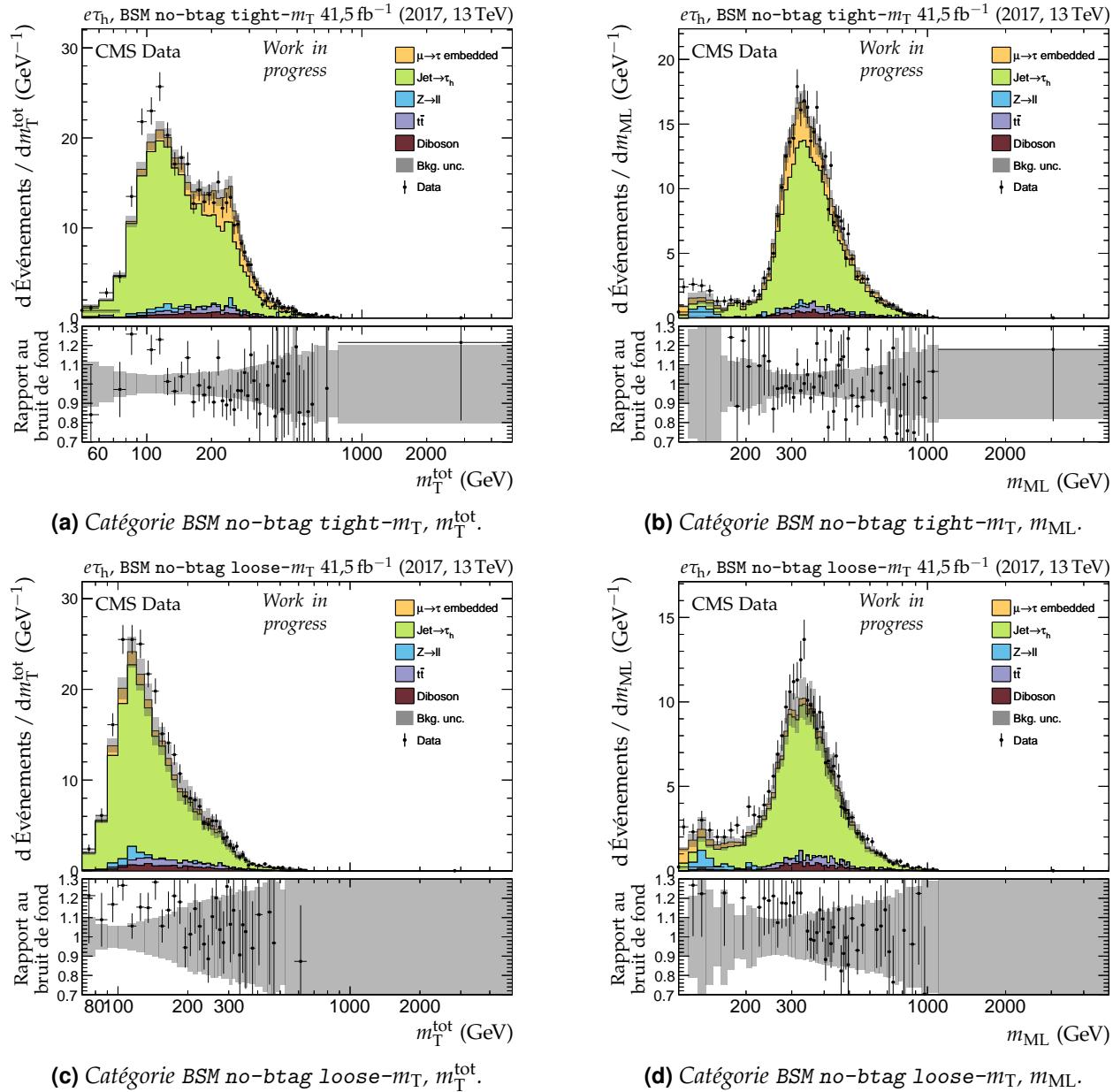
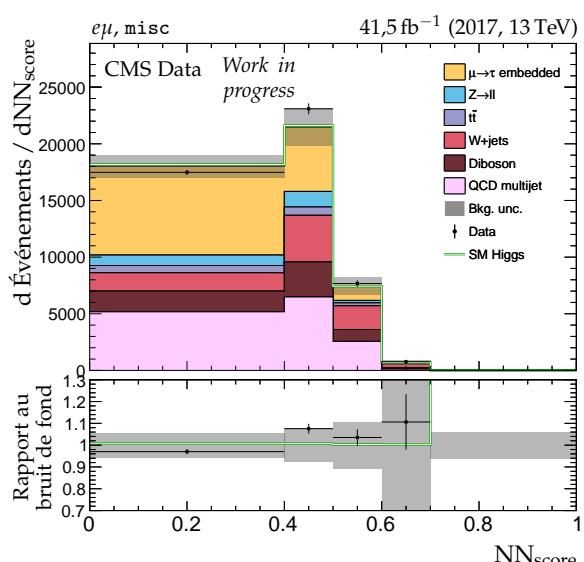
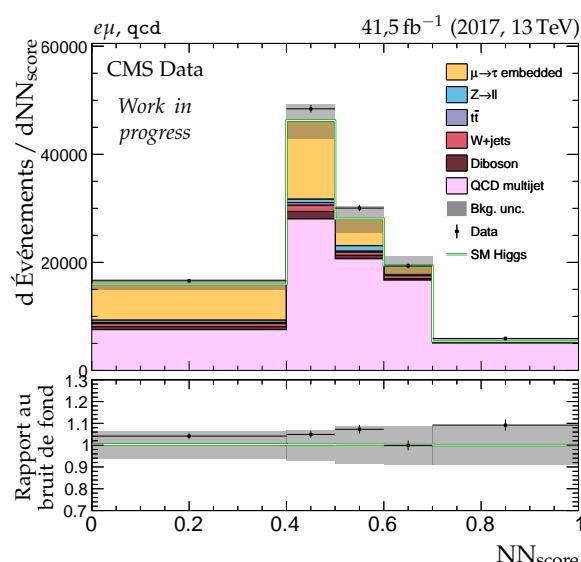
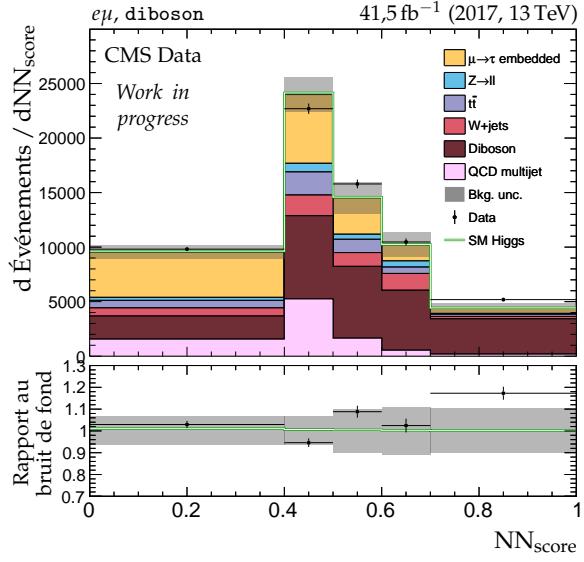
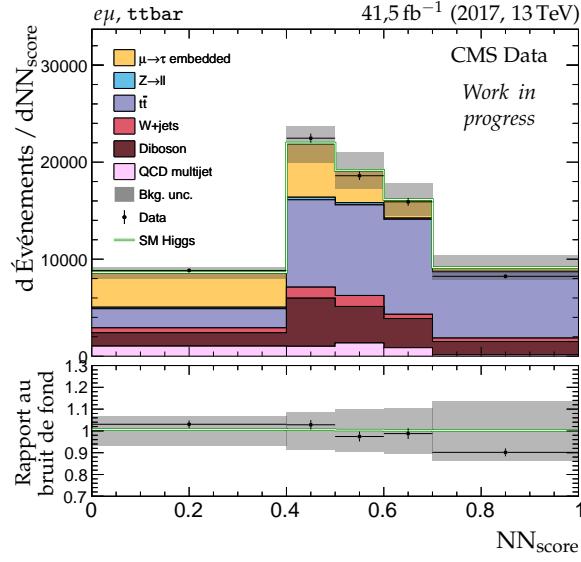
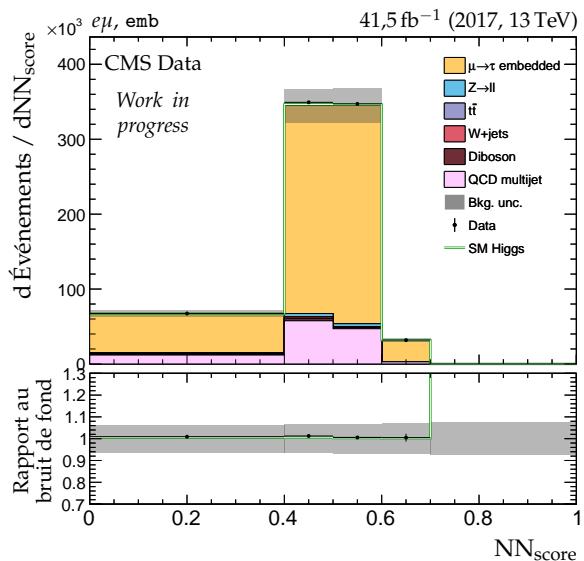
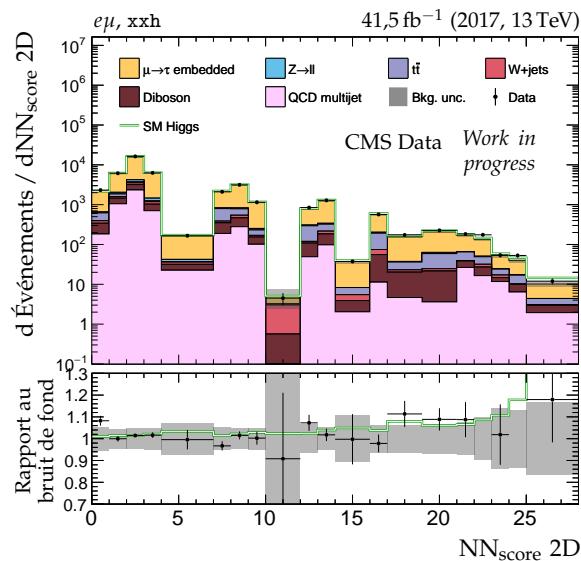


Figure X.24 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $e\tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.

Figure X.25 – Distributions de NN_{score} en 2017 dans le canal e μ .

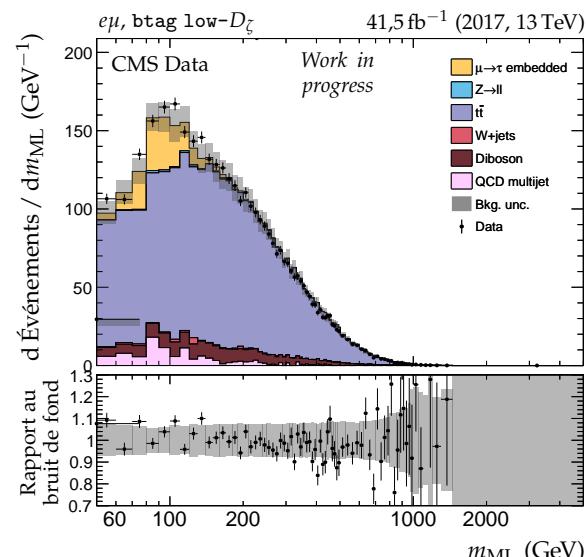
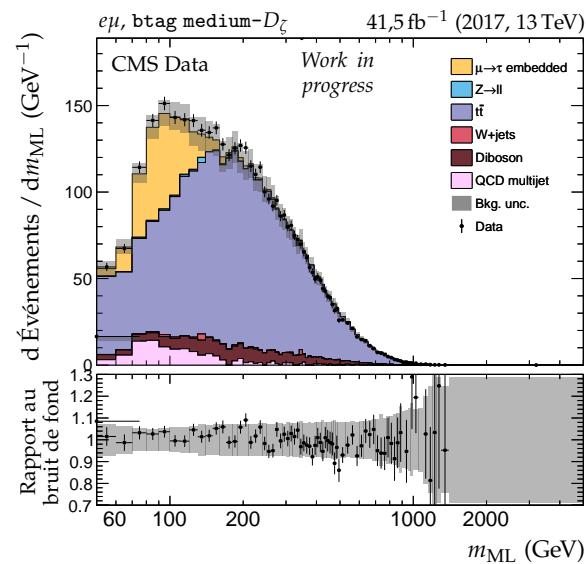
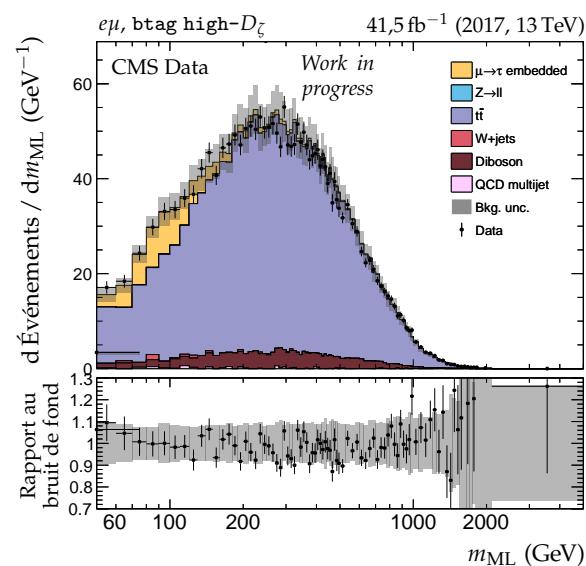
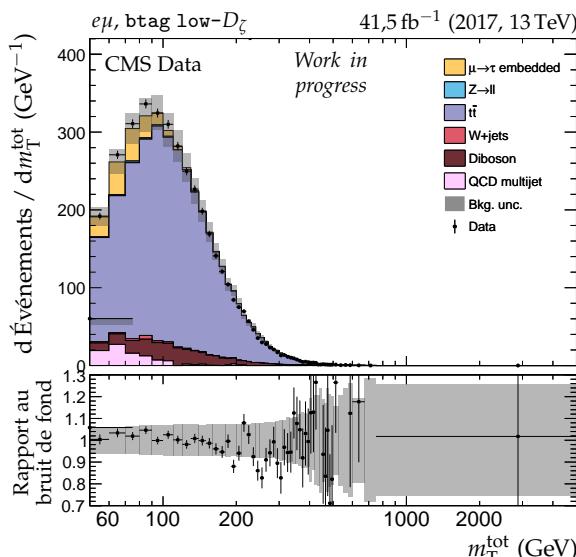
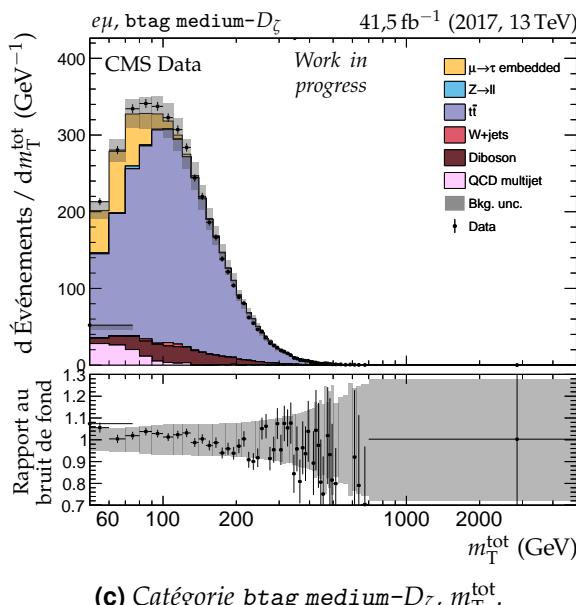
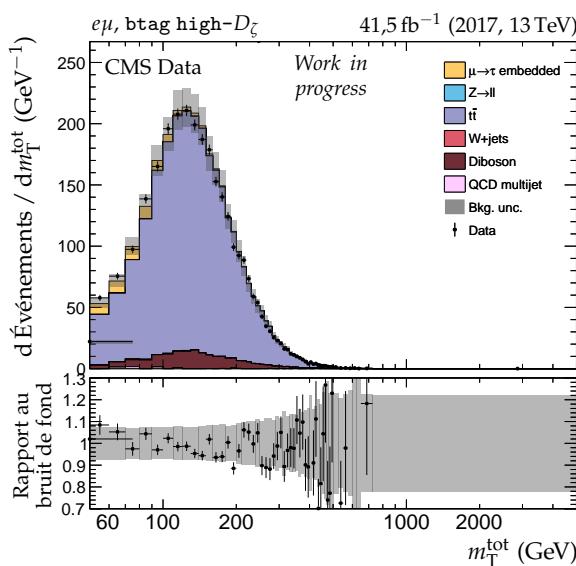


Figure X.26 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $e\mu$, catégories btag.

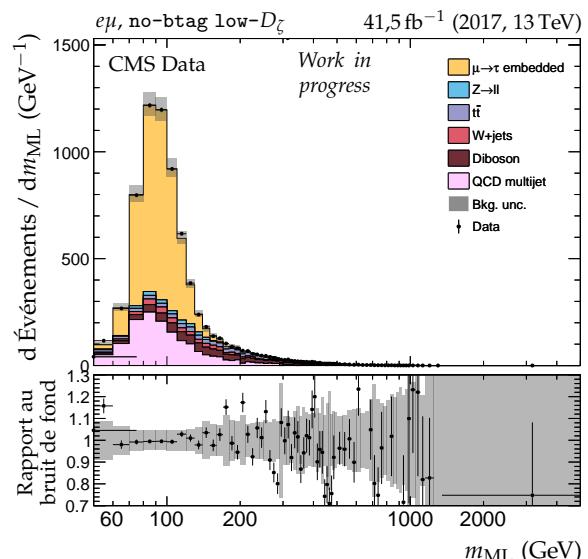
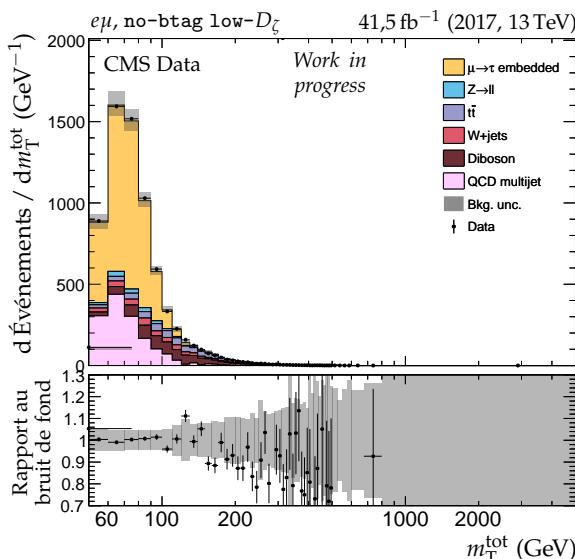
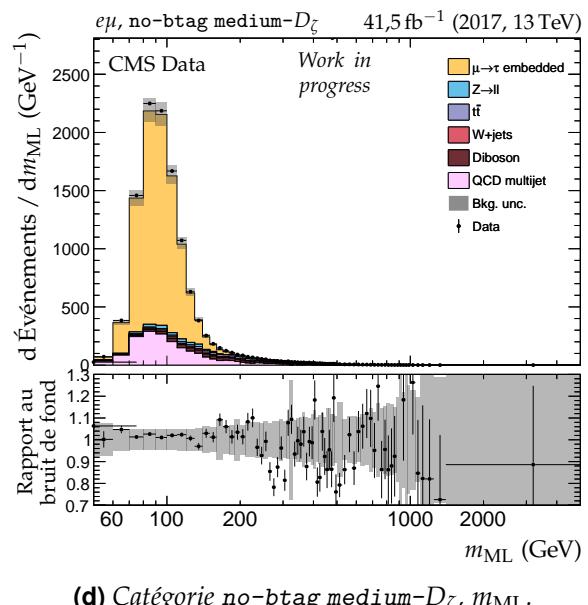
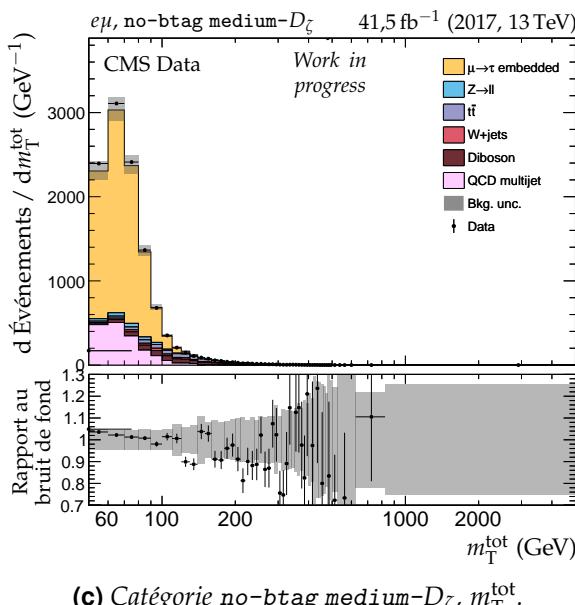
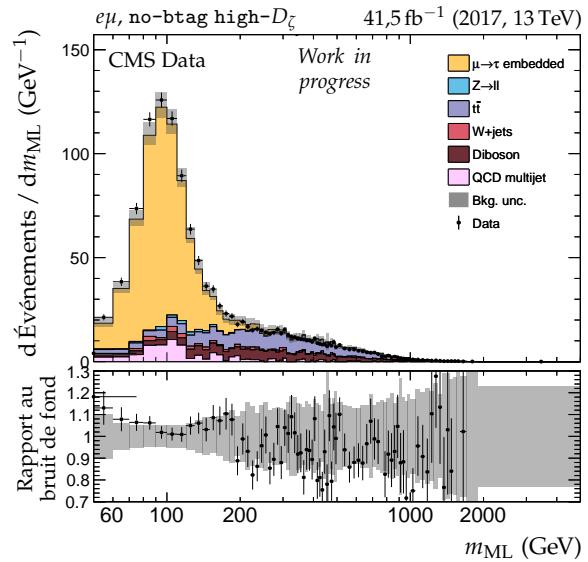
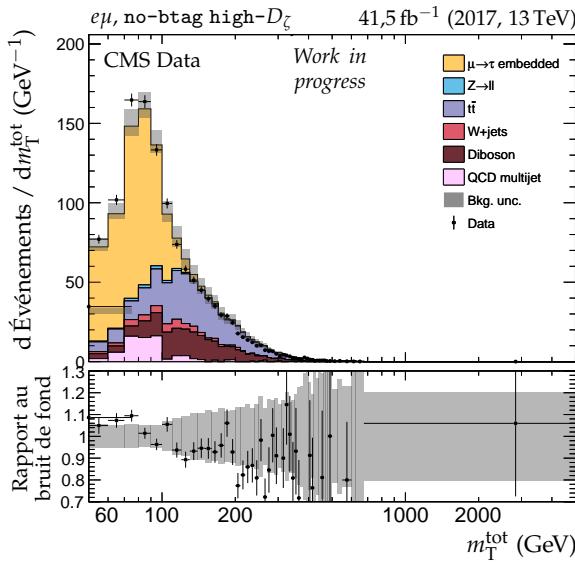
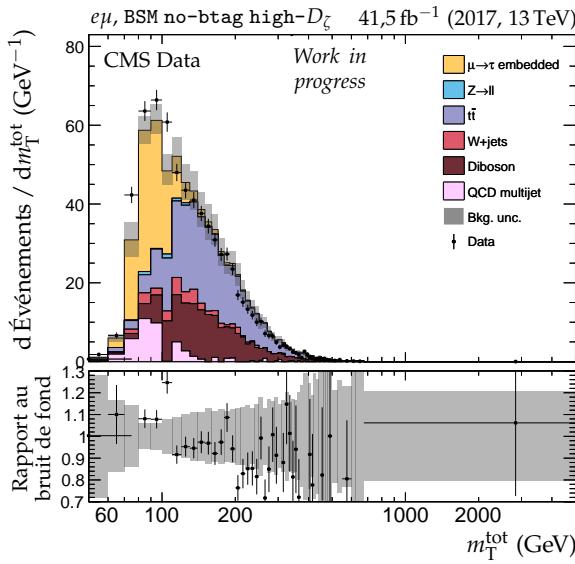
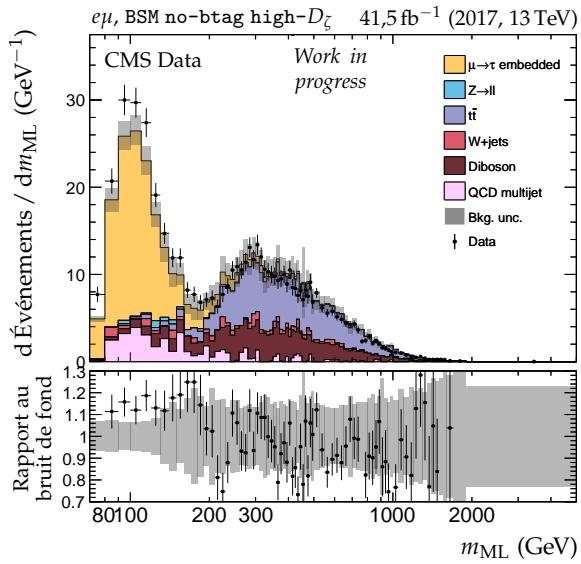
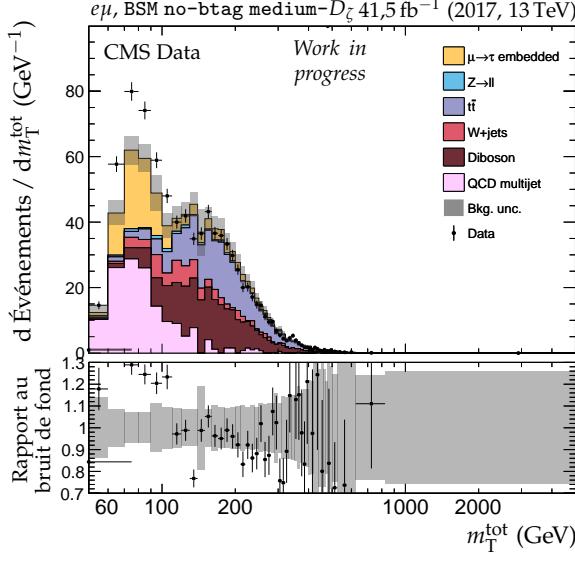
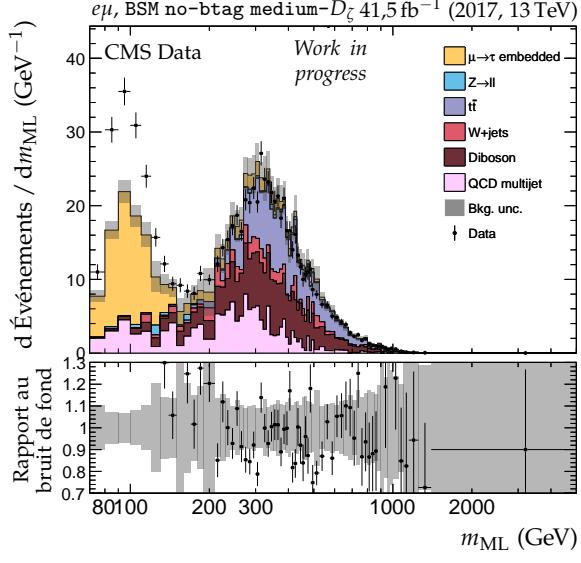
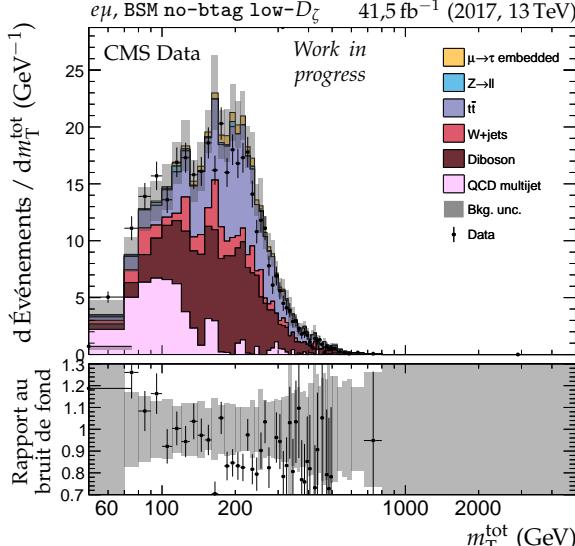
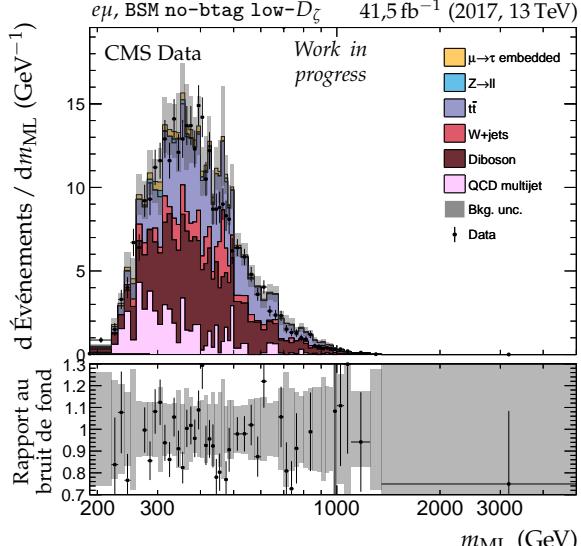


Figure X.27 – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal $e\mu$, catégories no-btag.

(a) Catégorie BSM no-btag high- D_ζ , m_T^{tot}.(b) Catégorie BSM no-btag high- D_ζ , m_{ML}.(c) Catégorie BSM no-btag medium- D_ζ , m_T^{tot}.(d) Catégorie BSM no-btag medium- D_ζ , m_{ML}.(e) Catégorie BSM no-btag low- D_ζ , m_T^{tot}.(f) Catégorie BSM no-btag low- D_ζ , m_{ML}.**Figure X.28** – Distributions de m_T^{tot} et m_{ML} en 2017 dans le canal e μ , catégories no-btag avec m_{SVFIT} \geqslant 250 GeV.

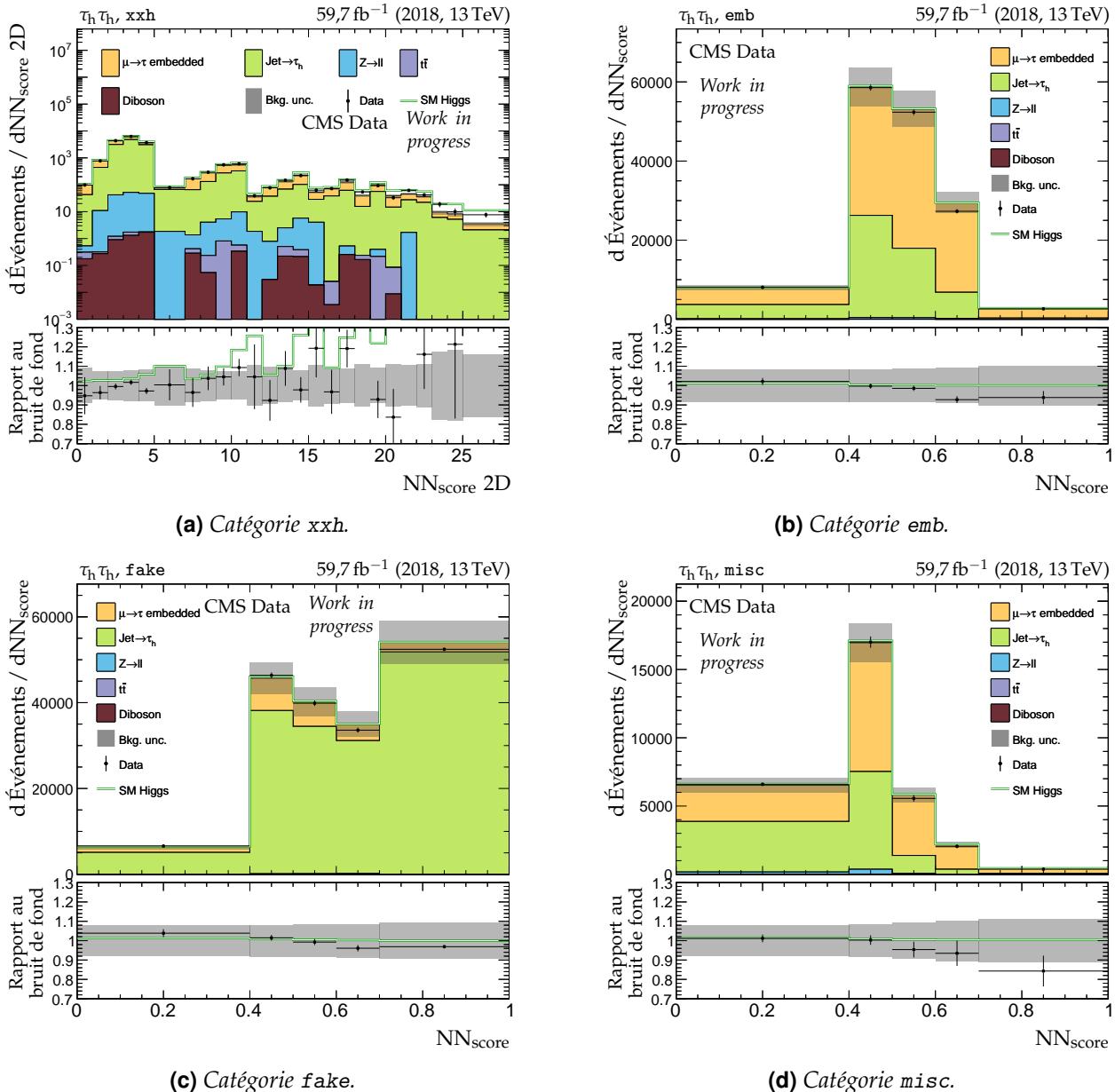


Figure X.29 – Distributions de NN_{score} en 2018 dans le canal $\tau_h \tau_h$.

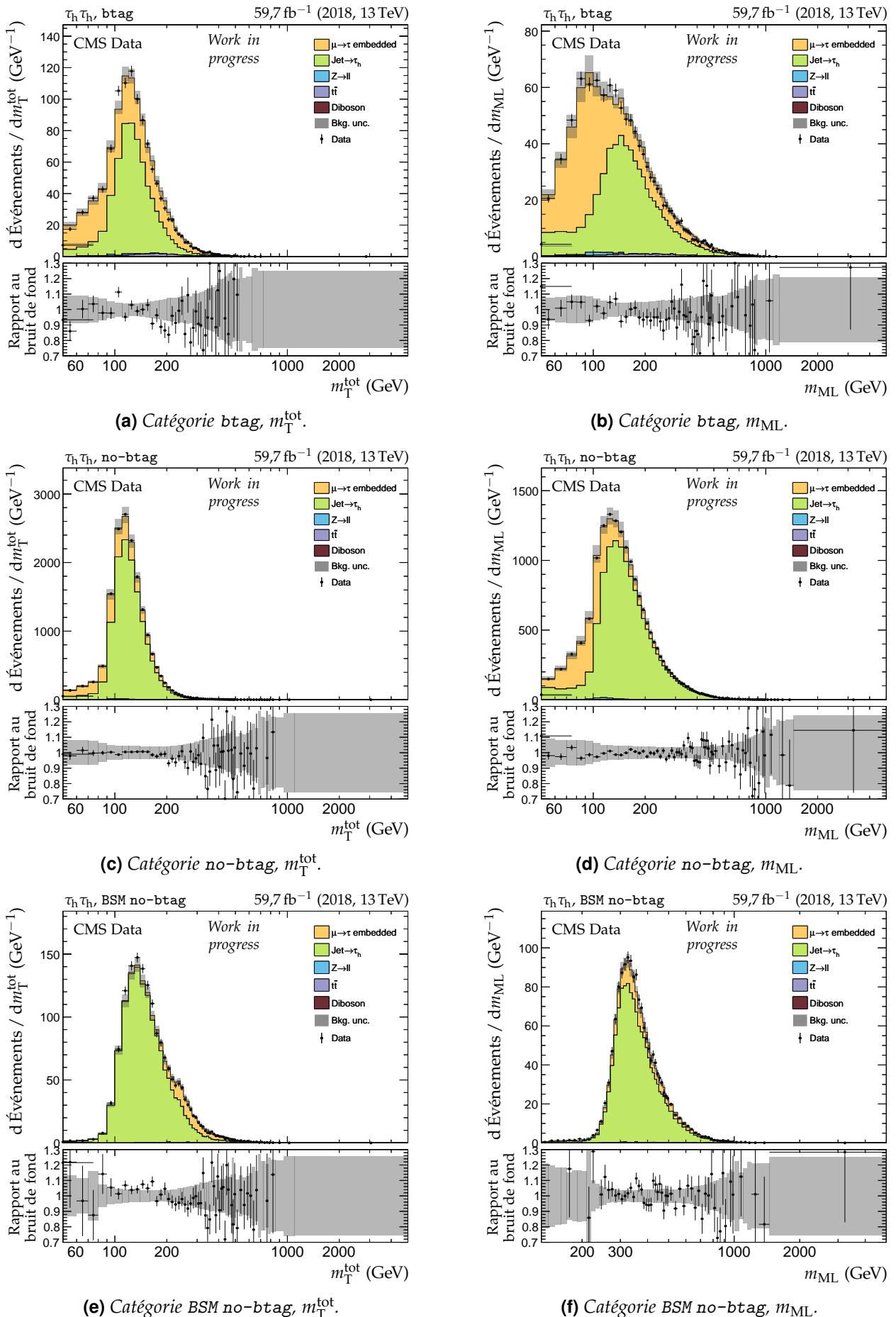
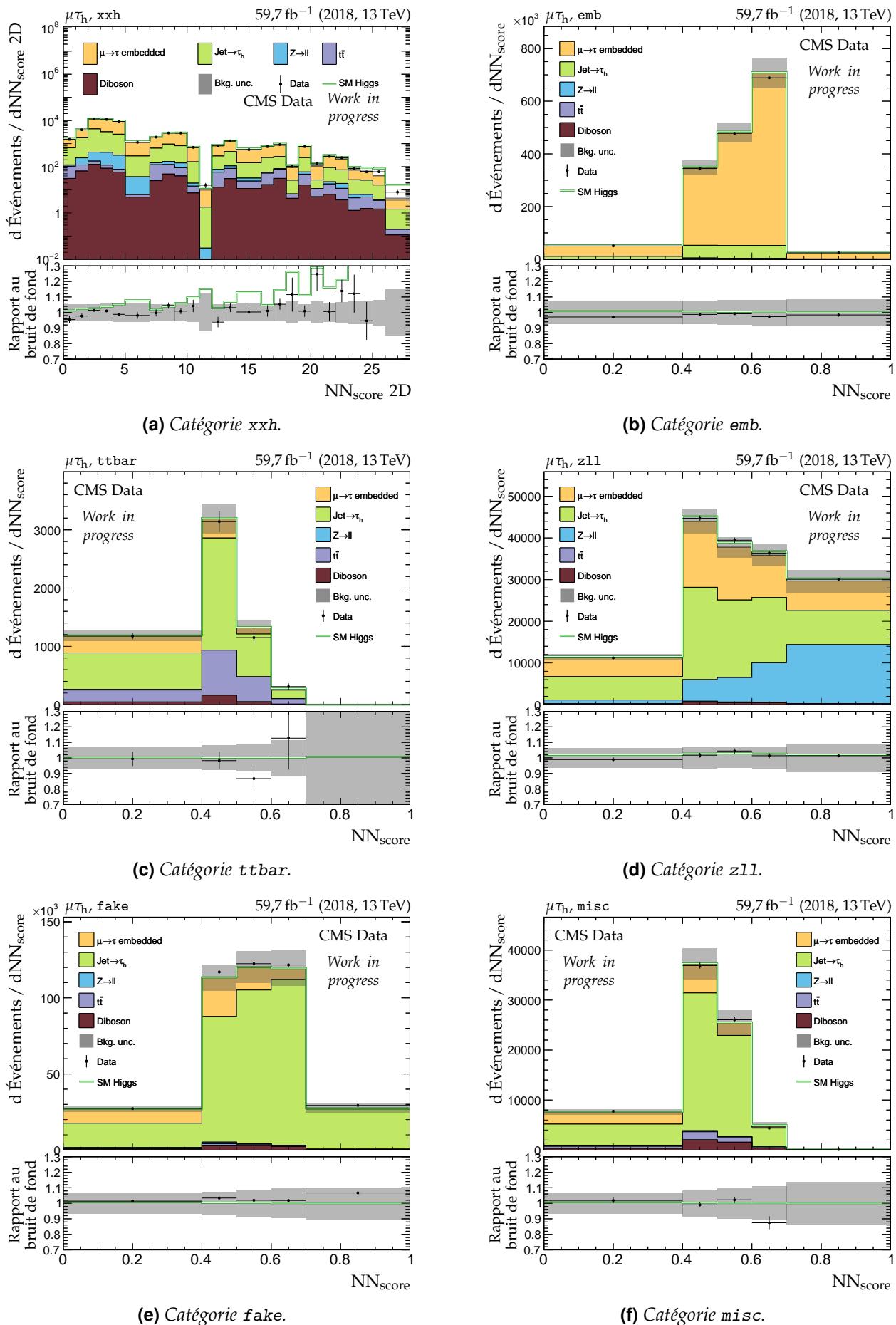


Figure X.30 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $\tau_h \tau_h$.


 Figure X.31 – Distributions de NN_{score} en 2018 dans le canal $\mu\tau_h$.

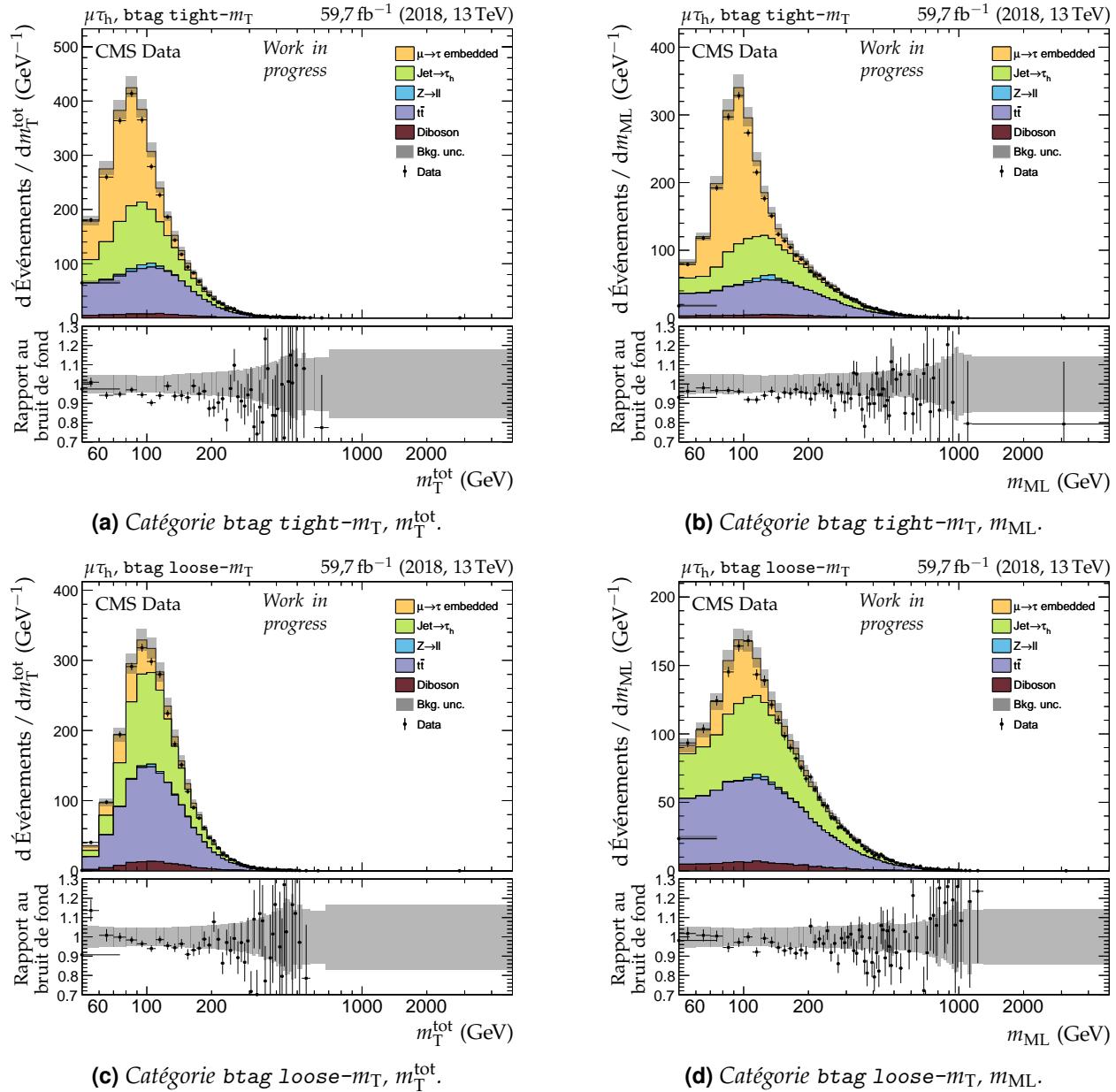
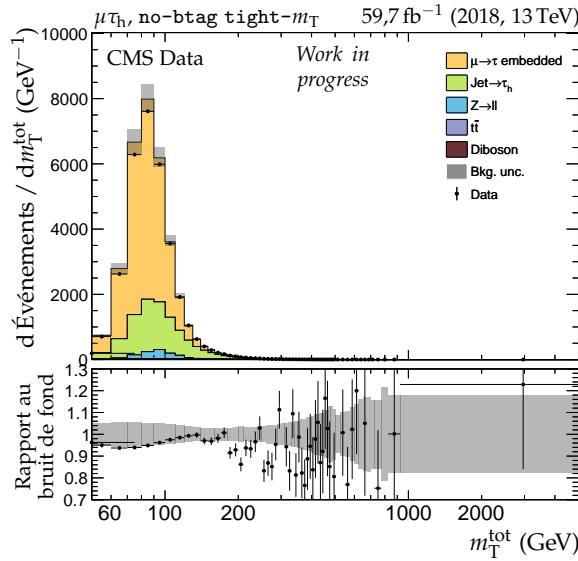
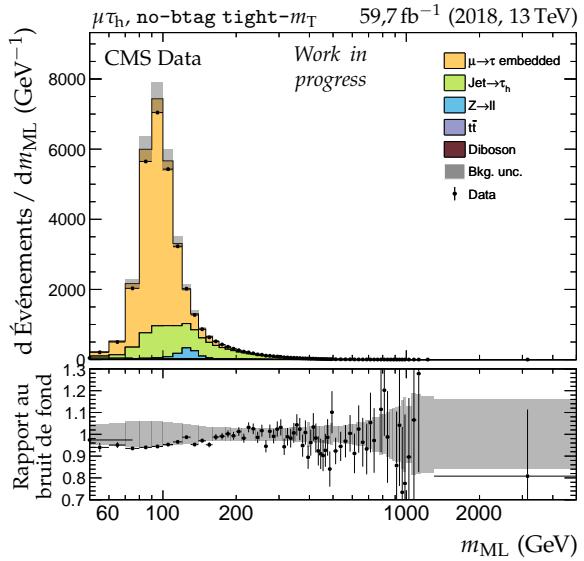
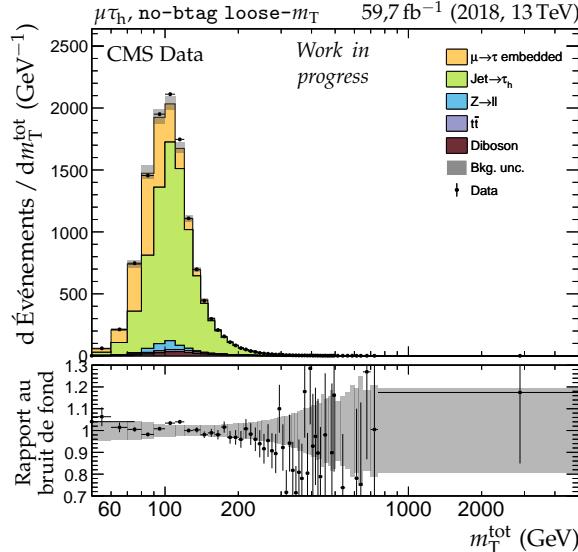
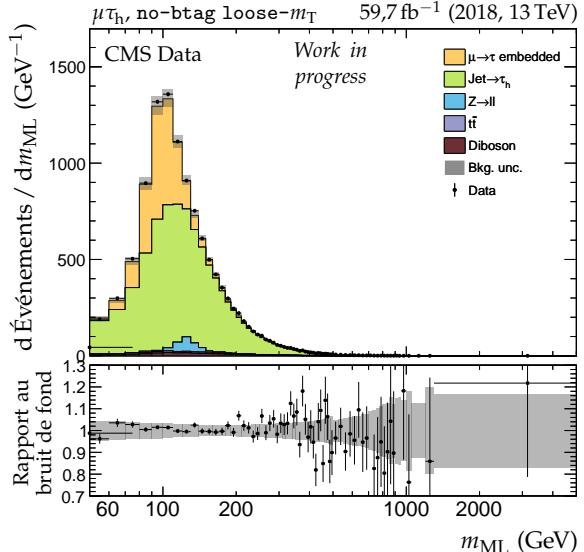


Figure X.32 – Distributions de $m_{\text{T}}^{\text{tot}}$ et m_{ML} en 2018 dans le canal $\mu\tau_h$, catégories $b\text{tag}$.

(a) Catégorie no-btag tight- m_T , m_T^{tot} .(b) Catégorie no-btag tight- m_T , m_{ML} .(c) Catégorie no-btag loose- m_T , m_T^{tot} .(d) Catégorie no-btag loose- m_T , m_{ML} .**Figure X.33** – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $\mu\tau_h$, catégories no-btag.

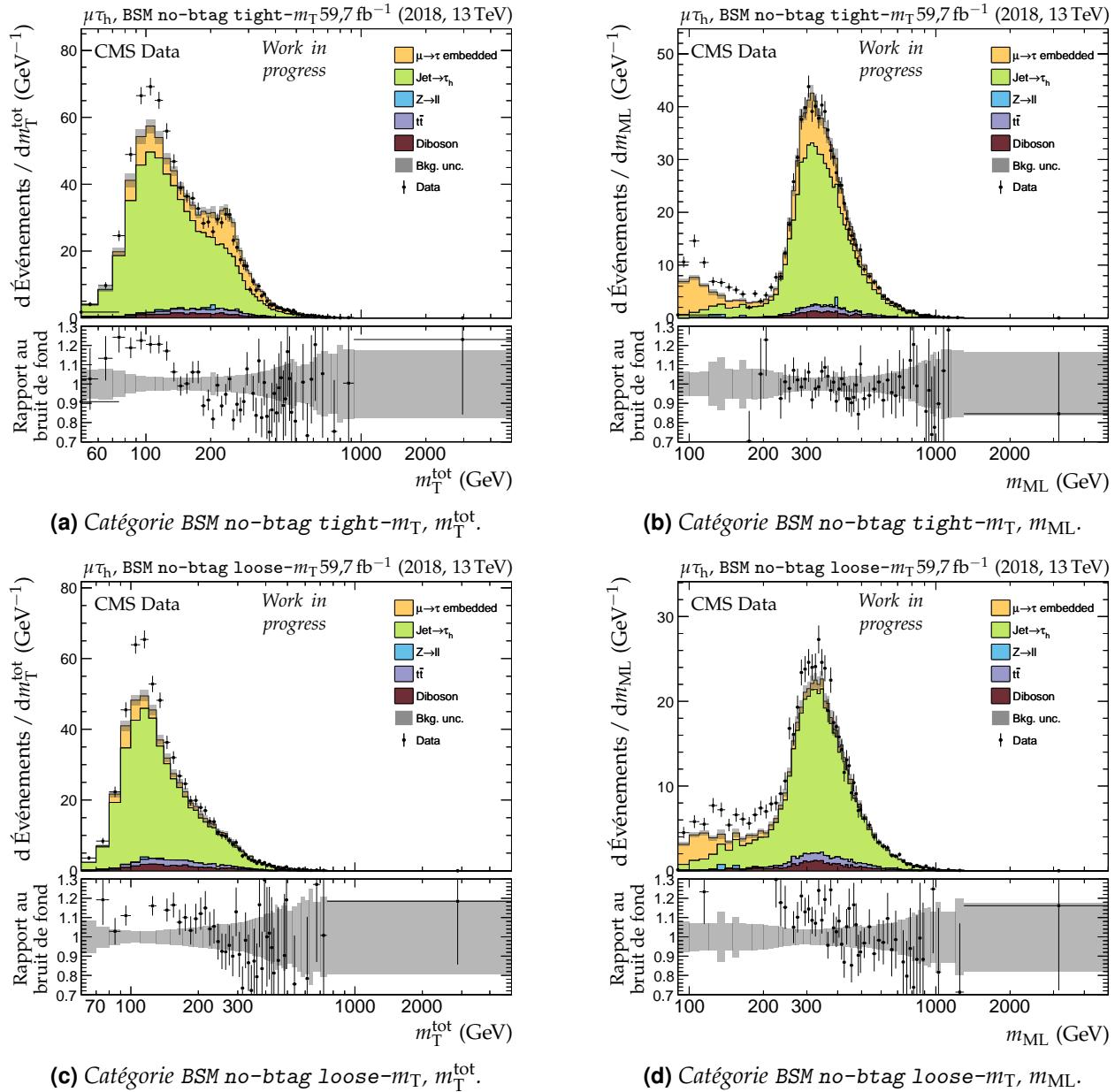


Figure X.34 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $\mu \tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.

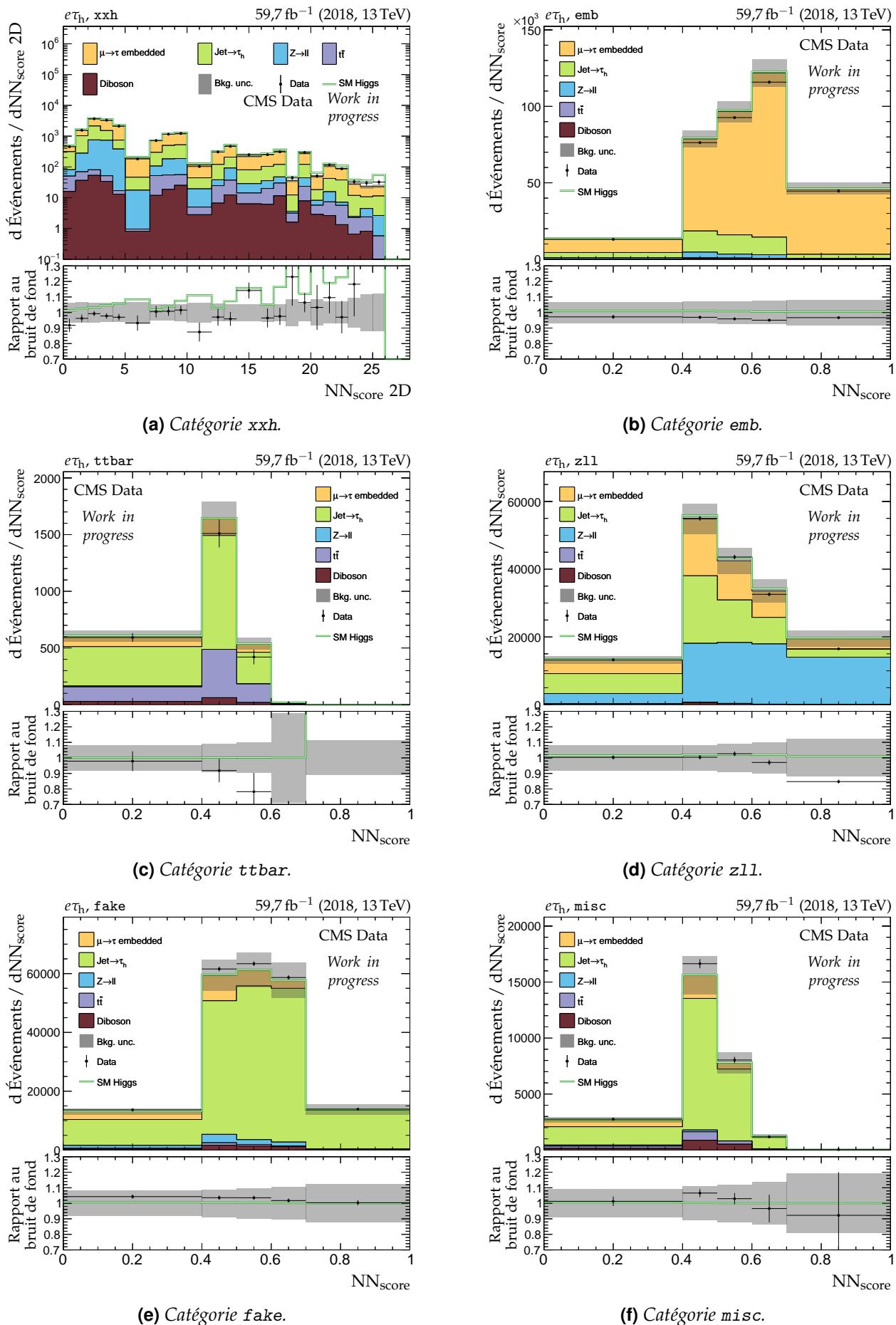


Figure X.35 – Distributions de NN_{score} en 2018 dans le canal $e\tau_h$.

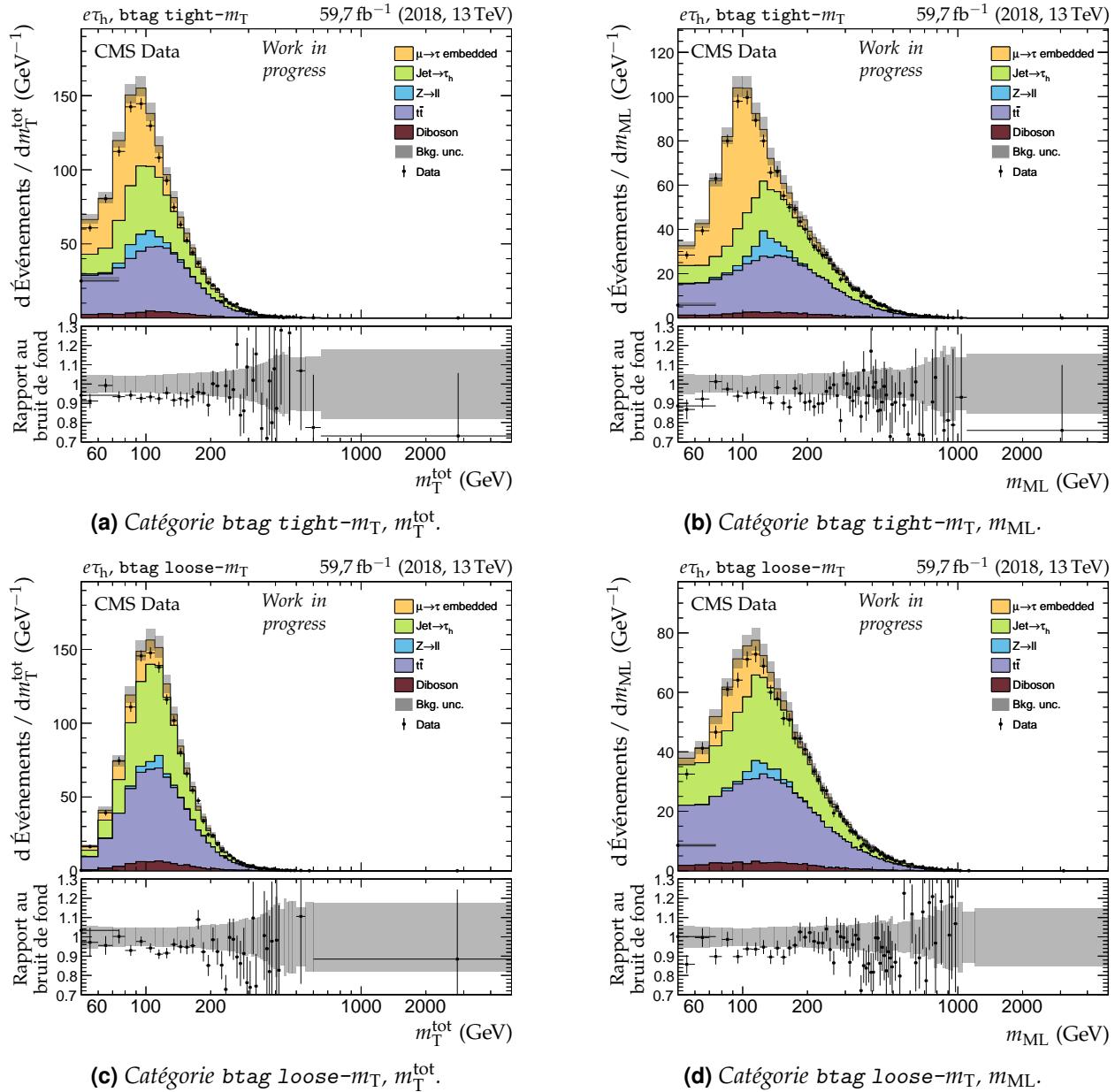
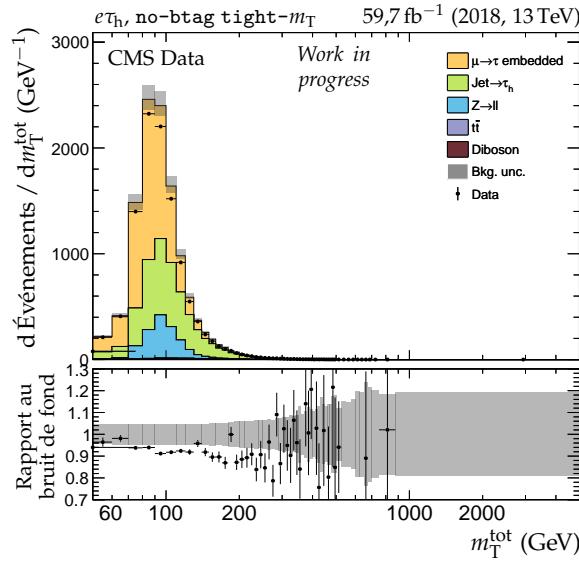
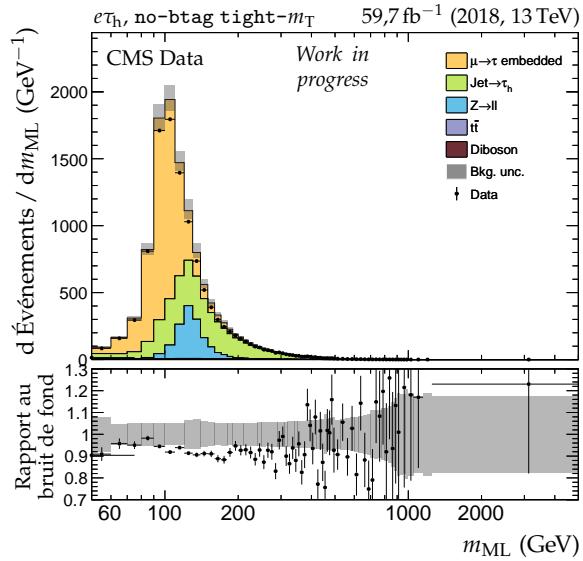
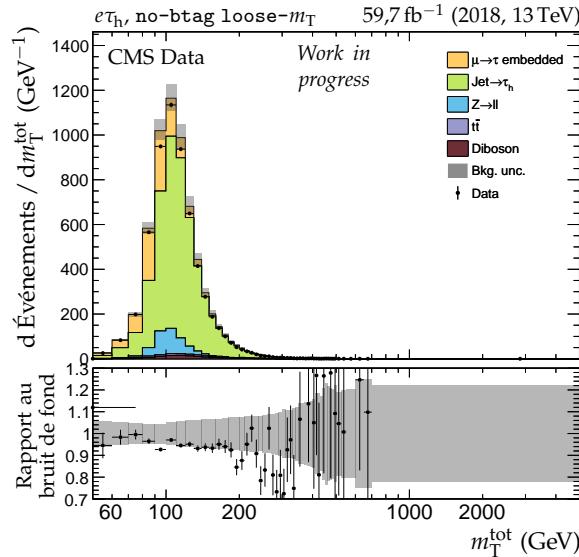
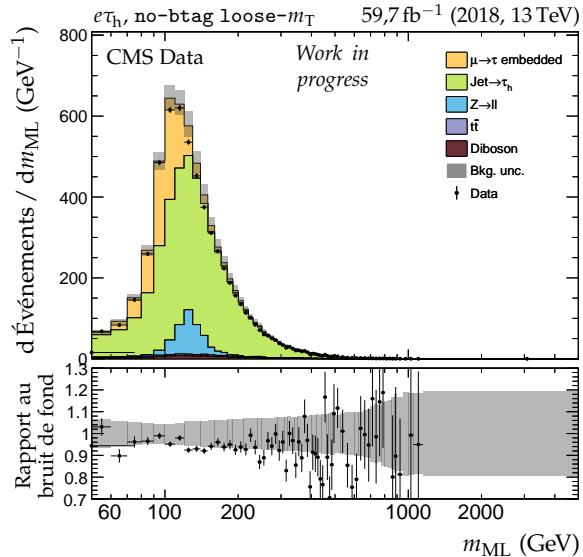


Figure X.36 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\tau_h$, catégories btag.

(a) Catégorie no-btag tight- m_T , m_T^{tot} .(b) Catégorie no-btag tight- m_T , m_{ML} .(c) Catégorie no-btag loose- m_T , m_T^{tot} .(d) Catégorie no-btag loose- m_T , m_{ML} .**Figure X.37** – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\tau_h$, catégories no-btag.

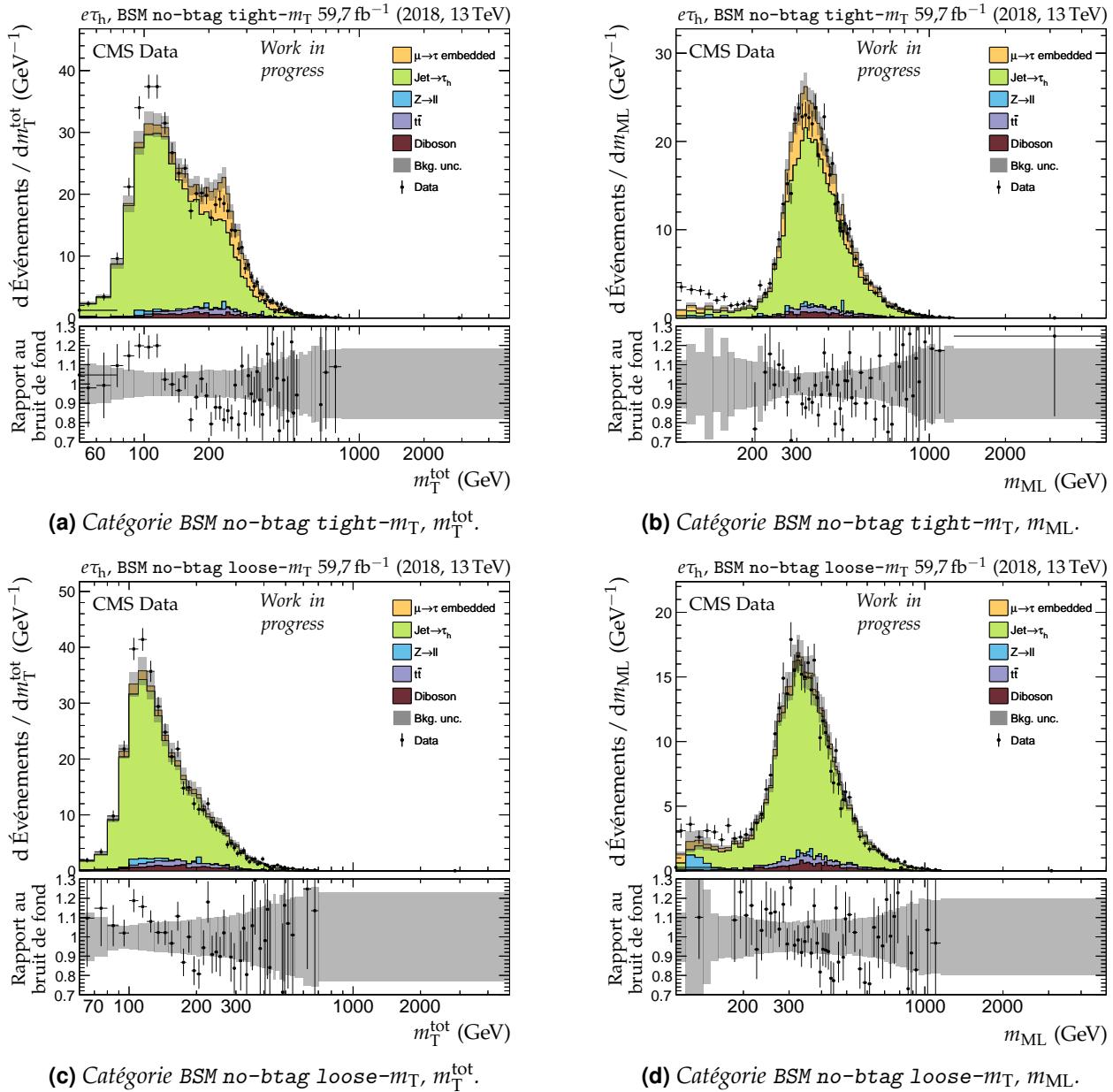
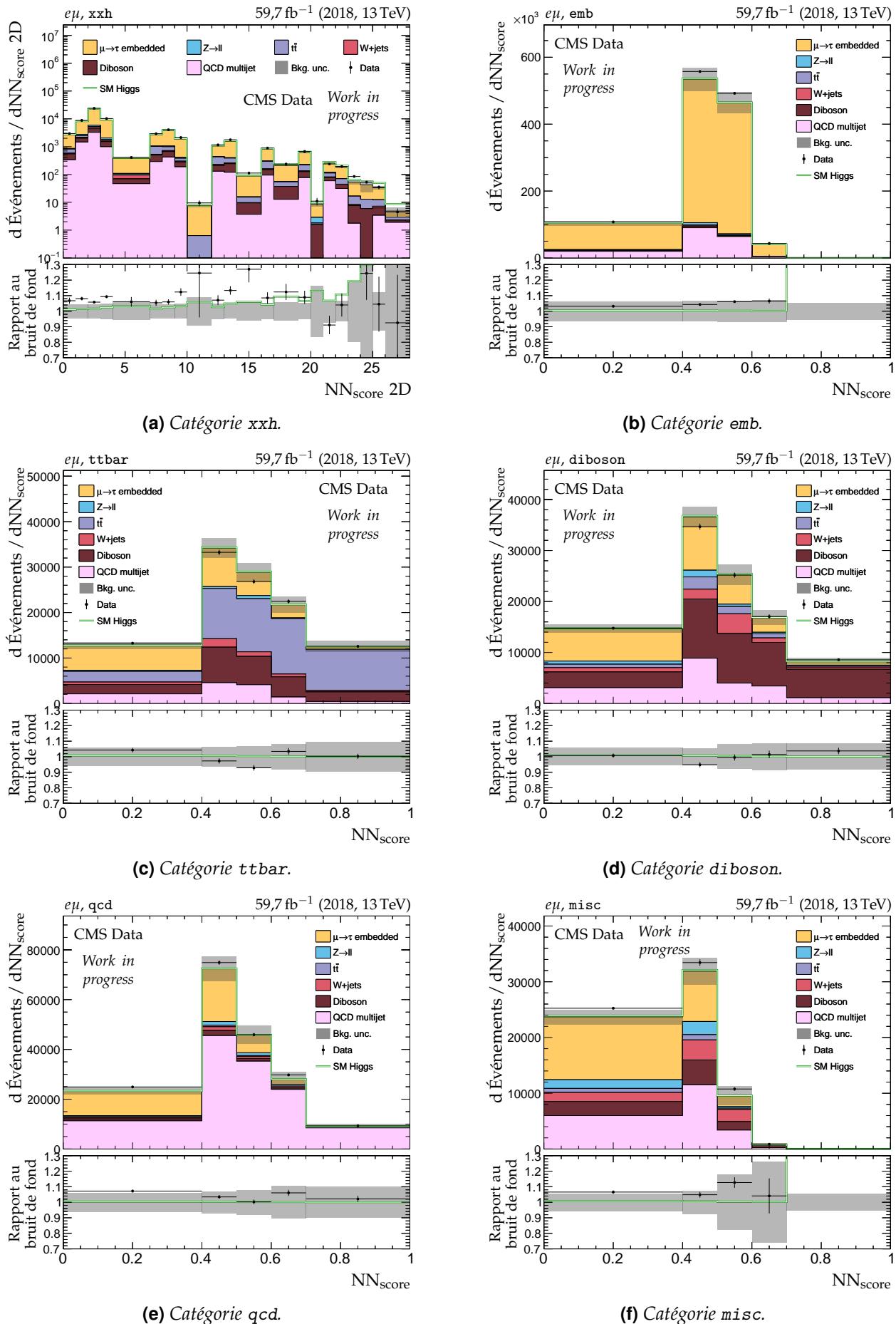


Figure X.38 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\tau_h$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.

Figure X.39 – Distributions de NN_{score} en 2018 dans le canal $e\mu$.

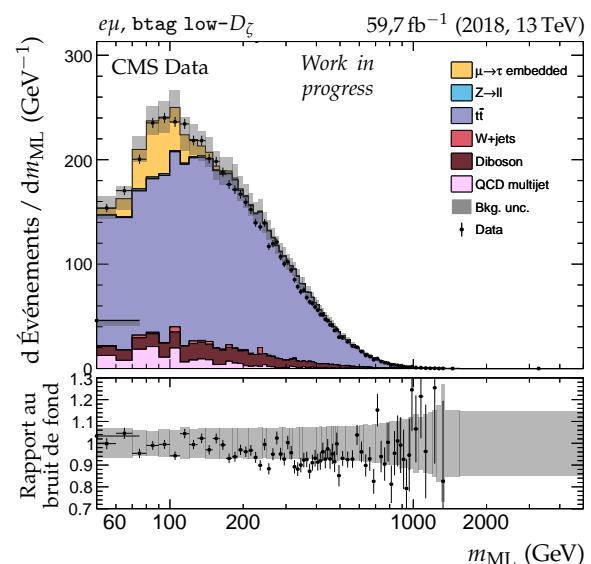
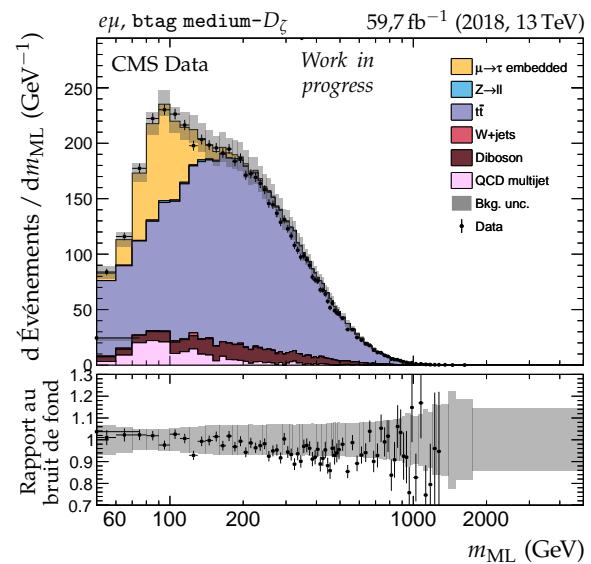
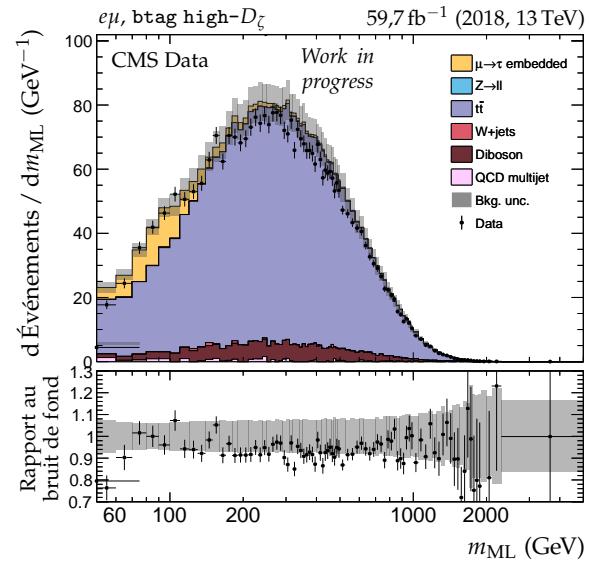
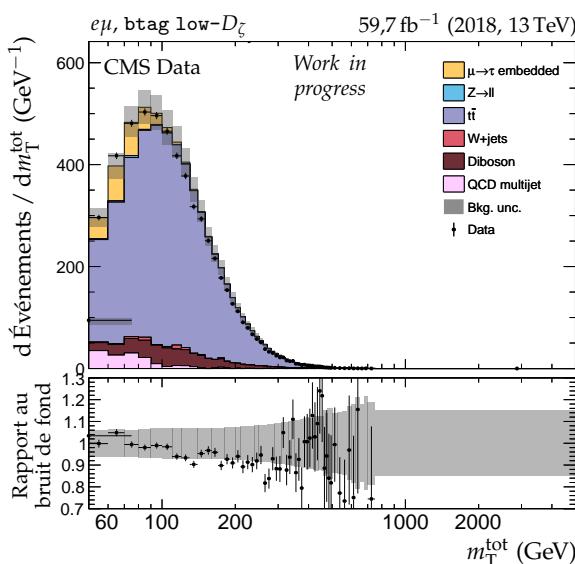
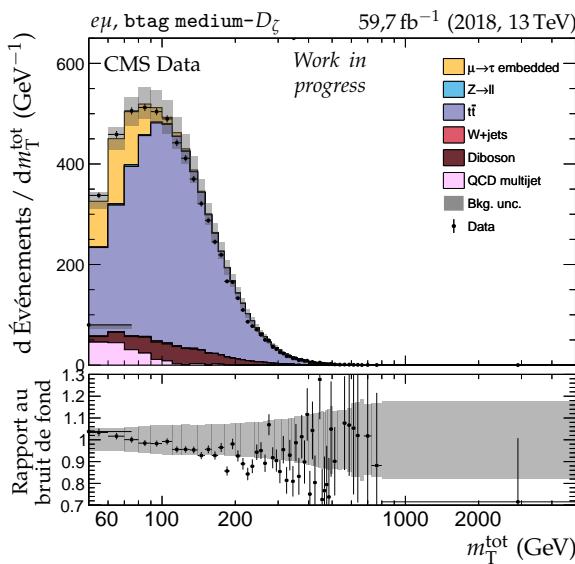
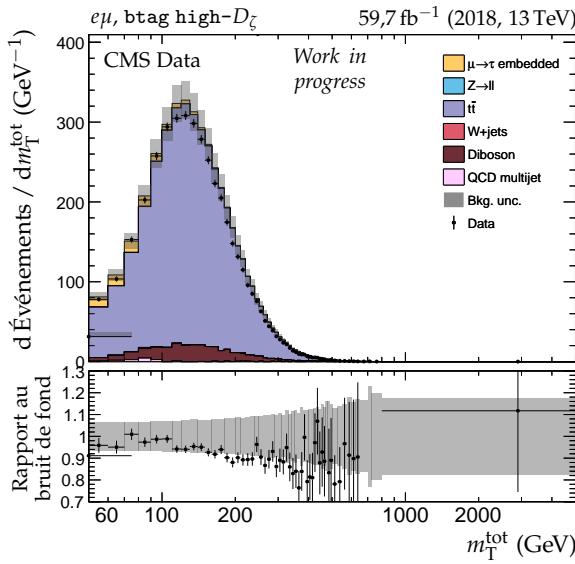


Figure X.40 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\mu$, catégories $b\text{tag}$.

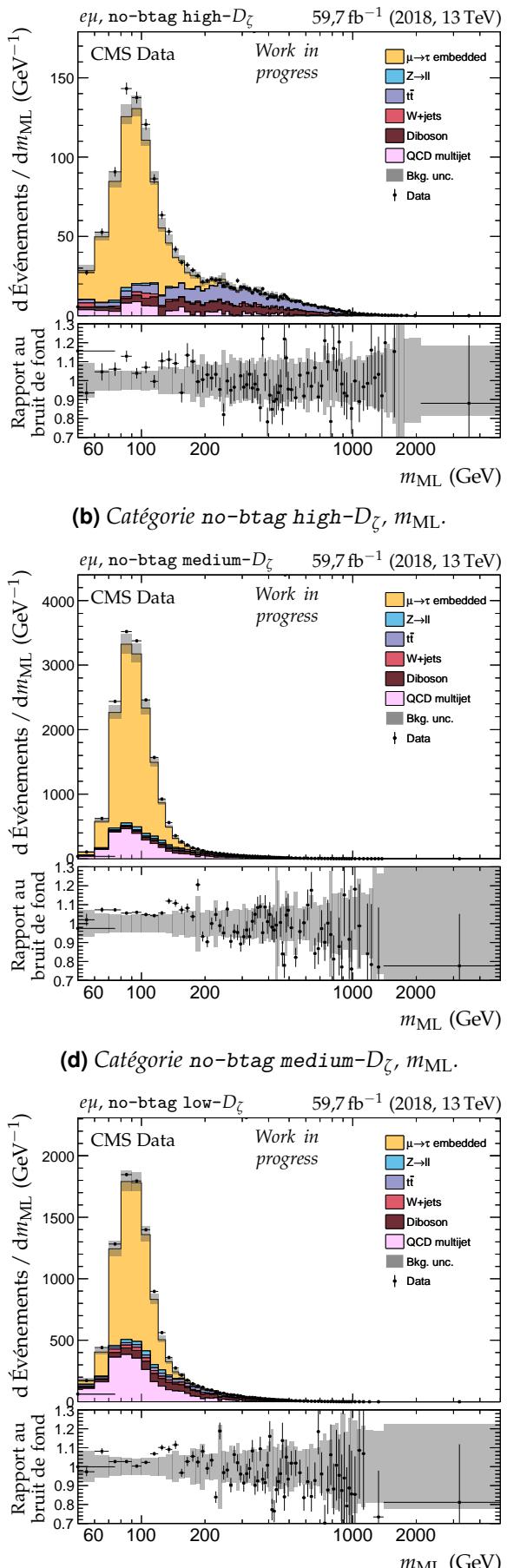
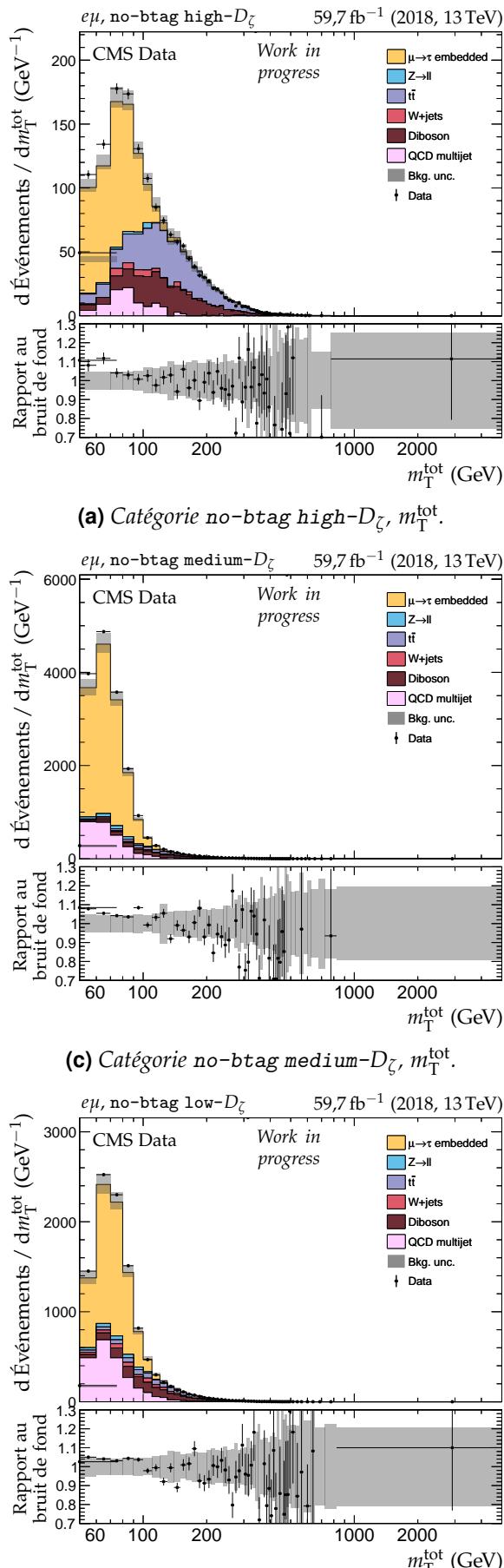


Figure X.41 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\mu$, catégories no-btag.

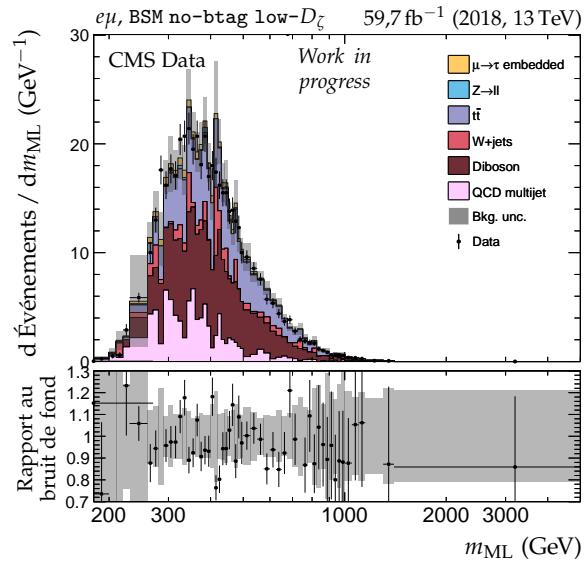
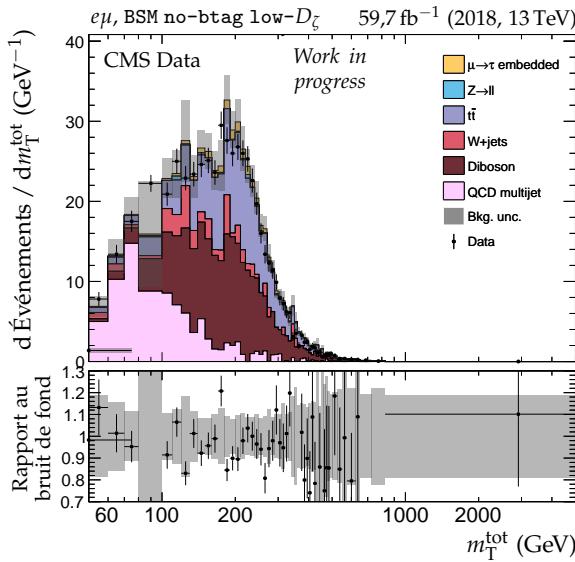
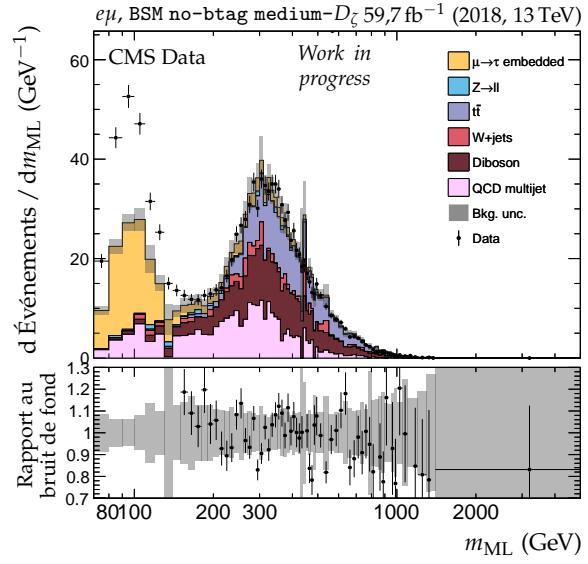
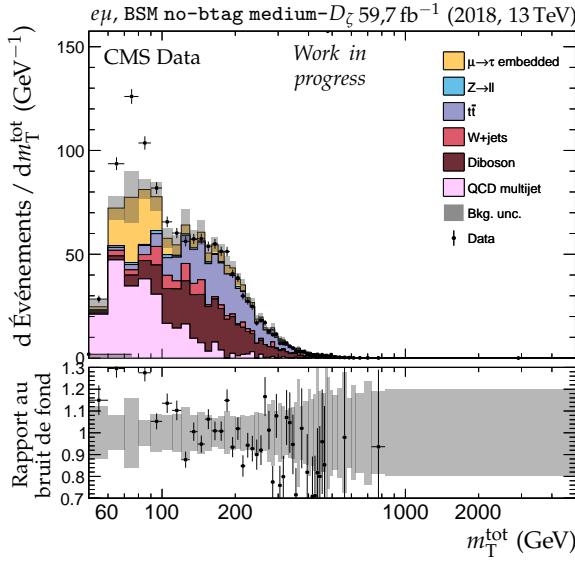
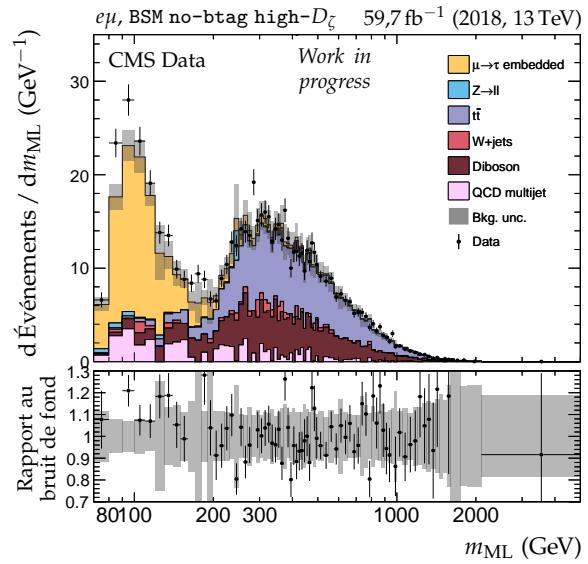
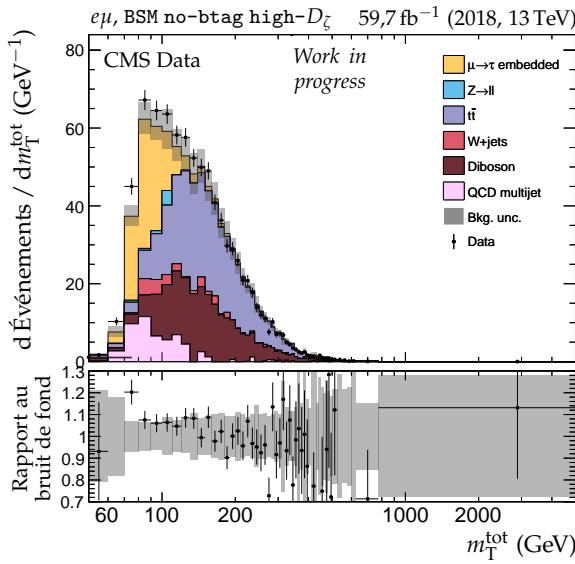


Figure X.42 – Distributions de m_T^{tot} et m_{ML} en 2018 dans le canal $e\mu$, catégories no-btag avec $m_{\text{SVFIT}} \geq 250 \text{ GeV}$.

